Rossi Mine Expansion Project

Draft Environmental Impact Statement
2018

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DOI-BLM-NV-E020-2015-0041-EIS

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Bureau of Land Management

Tuscarora Field Office

3900 Idaho Street

Elko, Nevada 89801

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
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3900 East Idaho Street
Elko, Nevada 89801
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In Reply Refer To:
1793/3809 (NV-0200)
NVN-070547

SEP 14 2018

Dear Interested Party:

The Rossi Mine Expansion Project Draft Environmental Impact Statement (DEIS) has been completed and is now available for public review and comment. The DEIS evaluates the environmental impacts that would result from the construction and operation of the Rossi Mine Expansion Project in compliance with the National Environmental Policy Act (NEPA) and associated regulations.

The proposed project would be located in the Bootstrap Mining District, in Elko County, Nevada, approximately 45 air miles northwest of Elko and 25 air miles north of Dunphy. The proposed project would include an expansion of existing mine facilities and the development of new facilities within the proposed expansion area.

Proposed activities within the proposed mine expansion area would include:

- Expansion of the Plan of Operations boundary;
- Expansion of the existing King Pit;
- Expansion of the existing Queen Lode and QLEE pits into the Queen Lode Complex Pit;
- Development of the Dawn Pit;
- Expansion of the existing King North Waste Rock Disposal Facility (WRDF);
- Construction of three new WRDFs (QLC North, QLC East, Dawn);
- Expansion and development of new roads;
- Construction of electric power distribution lines;
- Additional surface exploration within the project area; and
- Expansion or modification of ancillary and support facilities.

Under the Proposed Action, the Plan of Operations would increase to encompass 3,520 acres of BLM-administered land and 211 acres of private land. Construction and operation of the proposed project would result in approximately 1,167 acres of surface disturbance. The total surface disturbance for the project including existing, previously authorized, and proposed disturbance would be 2,063 acres on public and private lands. Upon completion of mining, the operation would be reclaimed.

Copies of the DEIS are available in the BLM Tuscarora Field Office, 3900 East Idaho Street, Elko, Nevada. The DEIS is also available on the BLM's e-planning NEPA website at https://go.usa.gov/xnRCr. Additional information is available online at http://www.blm.gov/nv,

which also provides access to the BLM's e-planning website by clicking on Programs, then Planning and NEPA, and then the E-Planning Portal and follow the steps to access the DEIS. Project materials may also be viewed at the BLM Tuscarora Field Office at the address indicated above, from 7:45 a.m. to 4:30 p.m., Pacific Time, Monday through Friday, except holidays.

The DEIS will be available for a minimum 45-day public comment period. Persons wishing to provide the BLM with comments on the DEIS should submit written comments to the BLM Tuscarora Field Office, 3900 East Idaho Street, Elko, NV 89801, Attn: Janice Stadelman. Comments should be postmarked or otherwise delivered to the Tuscarora Field Office by close of business on October 29, 2018 to ensure full consideration. Comments may also be faxed to Janice Stadelman at (775) 753-0347 or submitted electronically to blm_nv_eldo_rossimine_project_eis@blm.gov. Please make your comments as specific as possible.

Before including your address, phone number, email address, or other personal identifying information in your comment, you should be aware that your entire comment – including your personal identifying information – would be part of the public record for the project, and may be made publicly available at any time. While you may ask the BLM in your comment to withhold your personal identifying information from public review, we cannot guarantee that we would be able to do so.

If you would like any additional information, please contact Janice Stadelman, Project Lead, at (775) 753-0346 or jstadelm@blm.gov.

Sincerely,

Melanie A. Peterson

Melanie A. Peterson
Field Manager
Tuscarora Field Office

ROSSI MINE EXPANSION PROJECT

DRAFT ENVIRONMENTAL IMPACT STATEMENT

Project Name:	Draft Environmental Impact Statement Halliburton Energy Services Rossi Mine Expansion Project
Lead Agency:	U.S. Department of the Interior Bureau of Land Management Elko District Office, Tuscarora Field Office Elko, Nevada
Cooperating Agencies:	Nevada Department of Wildlife Elko County Board of Commissioners U.S. Fish and Wildlife Service Nevada Department of Conservation and Natural Resources, Sagebrush Ecosystem Technical Team
Project Location:	Elko County, Nevada
Correspondence on this EIS should be directed to:	Janice Stadelman, EIS Project Lead Bureau of Land Management Tuscarora Field Office 3900 E. Idaho Street Elko, Nevada 89801
Date by which comments must be postmarked to BLM:	Within 45 days of the date of the Notice of Availability published in the *Federal Register*

ABSTRACT

This Draft Environmental Impact Statement (EIS) analyzes potential impacts associated with the Halliburton Energy Services proposal for the Rossi Mine Expansion Project (Proposed Action). The Proposed Action is in the northern end of the Carlin Trend, approximately 45 miles northwest of Elko, in Elko County, Nevada, at the existing Rossi Mine site. The Proposed Action includes expansion of the existing King and Queen open pits and waste rock disposal facilities, construction of a new pit (Dawn Pit) and new waste rock disposal facilities, construction of new support facilities (i.e., electric power distribution lines, water wells, office buildings, and roads), and continued surface exploration activities within the project area. Barite ore would be processed on-site at the existing jig plant and/or transported by truck to Dunphy, Nevada, to the existing Halliburton processing facility, depending on ore grade. No dewatering is proposed for the Rossi Mine Expansion Project. The Proposed Action would create approximately 1,167 acres of surface disturbance on public land administered by the Bureau of Land Management. The project life is approximately 8 years for mining and ore processing. The project would employ up to 433 Halliburton Energy Services workers and contractors over the life of the project, depending on barite market conditions.

Responsible Official for Draft EIS: Melanie Peterson, Field Manager
Tuscarora Field Office

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Executive Summary

Introduction

Halliburton Energy Services (HES) proposes to construct, operate, and reclaim the Rossi Mine Expansion Project (project). The proposed project would expand existing operations at the Rossi Mine, with the intent of increasing production rates of processed barite ore. The proposed project is in the northern end of the Carlin Trend, within Elko County, Nevada, approximately 25 miles north of the town of Dunphy.

HES and its predecessors have actively mined barite from the Rossi Mine using open pit methods since 1947. Mining operations are conducted on private (patented) and unpatented mining claims controlled by Barrick Gold Exploration Inc. (Barrick) and leased to HES. The unpatented claims are on public lands managed by the Bureau of Land Management (BLM), Tuscarora Field Office.

Summary of the Proposed Action

The proposed project would be an expansion of the existing Rossi Mine, which is operated by HES under Plan of Operations (PoO) NVN-070547. HES submitted a Plan of Operations modification (NVN-070547) and Reclamation Permit Application (No. 0257) (SRK 2014a) for the expansion of the Rossi Mine to the BLM in August 2014.

The Proposed Action includes the following components: continued surface exploration drilling throughout the project area, expansion of the plan of operations boundary/project area, expansion of the existing King Pit, expansion of the existing Queen Lode and Queen Lode Eastern Extension (QLEE) pits into the Queen Lode Complex (QLC) Pit, development of the proposed Dawn Pit, expansion of the existing King North Waste Rock Disposal Facility (WRDF), construction of three new WRDFs (QLC North, QLC East, Dawn), expansion or improvement of existing ponds for water storage and supply, expansion and development of roads, installation of buried power distribution lines within the PoO boundary, and expansion of ancillary support facilities.

Operations under the Proposed Action would utilize all of the existing ore processing and support facilities. Mining operations and surface exploration would be extended for an additional 8 years. New surface disturbance under the Proposed Action would include a total of 1,167 acres of public and private land. The total project disturbance would include 896 acres of previously authorized disturbance for a total disturbance of 2,063 acres, of which 1,854 acres would be on public land and 209 acres on private land. Final reclamation would be completed during a 5-year period following cessation of mining and ore processing operations. HES would reclaim all areas within the PoO boundary disturbed by mining, processing, and exploration activities in accordance with BLM and Nevada Division of Environmental Protection (NDEP) – Bureau of Mining Regulation and Reclamation (BMRR) regulations, state requirements (Nevada Administrative Code [NAC] 519A), and the approved Rossi Mine Reclamation Plan (No. 0257). Reclamation activities are designed to meet the BLM regulations contained in 43 Code of Federal Regulations (CFR) 3809 and achieve post-mining land uses consistent with the Elko Resource Area Resource Management Plan (RMP) (BLM 1986b).

Under the Proposed Action, approximately 143.5 million tons of waste rock would be generated by mining operations in addition to the 43.5 million tons of waste rock previously authorized to be placed in WRDFs at the existing Rossi Mine. Waste rock produced under the Proposed Action would be disposed of in the expanded King North WRDF, proposed QLC North WRDF, QLC East WRDF, Queen West WRDF, and Dawn WRDF or placed as backfill in the Dawn Pit. The majority of waste rock generated from the King and QLC pits under the Proposed Action would consist of chert from the Vinini geologic formation.

Under the Proposed Action, all new distribution line extensions would be buried underground in conduit according to industry standards.

Summary of the Project Alternatives

Three alternatives to the Proposed Action were considered for detailed analysis in the Environmental Impact Statement (EIS), including the Reconfiguration Alternative, the Livestock Fencing Alternative, and the No Action Alternative. One other alternative to the Proposed Action was considered but eliminated from detailed analysis.

Summary of Impacts Associated with the Proposed Action

Geology and Minerals

Direct impacts on geologic and mineral resources from the proposed project would include 1) the generation and permanent disposal of approximately 143.5 million tons of waste rock and 2) the mining and processing of barite ore.

The expansion and operation of existing open pits and WRDFs, in addition to the construction and operation of the proposed open pits and WRDFs, would permanently alter the natural topographic and geomorphic features over approximately 2,063 acres, of which approximately 1,167 acres are previously authorized. Approximately 194 acres (205 acres of open pits – 11 acres of backfilled pits [9-acre Dawn Pit and 2-acre Queen Lode Pit new disturbance backfilled = 194 acres of open pit remaining, see **Table 2-10**]) of proposed open pits would not be backfilled or reclaimed. The expanded and proposed WRDFs would be reclaimed at the completion of mining operations but would permanently alter the natural topography and geomorphology of the project area.

Geotechnical studies and stability analysis of the proposed open pits indicate that the facilities would be stable during construction and operation of the proposed project. Additional geotechnical studies would be incorporated into the final design, operation and maintenance procedures, and closure of these facilities.

Water Resources and Geochemistry

Under the Proposed Action, groundwater pumping from water supply wells would be extended an estimated 8 years longer than required for the currently authorized activities included in the No Action alternative. The incremental increase in pumping attributable to the Proposed Action (compared to currently permitted operations included in the No Action Alternative) is 192.5 gallons per minute (gpm). Drawdown of groundwater aquifers from water supply wells is anticipated to be localized to within the proposed PoO boundary. Depth to groundwater measurements within the project area have indicated that the water table is not connected to the surface water ponds or spring sites therefore no impacts to perennial spring surface flows are anticipated as a result of groundwater pumping from water supply wells.

Completion of the King North and King South WRDFs under current authorizations would result in the continued covering of the drainage or flow from two spring locations within the project area that were covered in the past. Both spring drainages or flow locations were covered years ago by the expansion of the King North and King South WRDFs. The Proposed Action includes the installation of trenched sub-drain systems to convey flow to the existing channel and to maintain slope stability of the WRDFs. Short reaches of unnamed ephemeral stream channels would be removed by proposed project components. These mostly occur in the footprint areas of the QLC North WRDF, QLC East WRDF, Dawn WRDF, and QLC Pit.

Disturbance under the Proposed Action would remove 1,075 acres of the contributing watershed to Antelope Creek and approximately 393 acres of contributing watershed area would be removed from the upper Boulder Creek drainage. These are the drainage areas that would be captured as part of the mine stormwater control system that would not flow into the Antelope Creek or Boulder Creek watersheds and is not directly related to mine surface disturbance. The overall impacts of these drainage modifications on flow quantities monitored at Antelope Creek and Boulder Creek would probably not be measurable as these drainages are usually dry and flow in response to precipitation events and spring runoff. Potential impacts to floodplains and flood hydrology from the proposed project would be minimal.

Depending on actual well locations, and the site-specific aquifer properties, local drawdown associated with groundwater pumping could affect existing groundwater rights. Impacts to wells could include a reduction in yield, increased pumping cost, or if the water level were lowered below the pump setting or the bottom of the well, make the well unusable. Specific impacts to wells would depend on the site-specific hydrogeologic conditions, well completion details, and timing of the drawdown.

Depending on the groundwater inflow rates, combined with runoff from the pit wall and direct precipitation, potential resulting flows may be sufficient for a pit lake to develop in the west lobe of the King Pit and QLC Pit. Review of available data suggest that the potential for development of pit lakes with low pH, or high metals concentrations appears to be low. Under the Proposed Action, groundwater (excluding localized perched zones that could be encountered during mining) is unlikely to be encountered during mining, or in the post-mining period in the Queen Lode Pit, and Dawn Pit. Based on the geochemical characterization results, stormwater management controls, and planned reclamation, runoff from the WRDFs is not expected to impact surface water quality in Antelope Creek or Boulder Creek.

Cultural Resources

Direct effects to cultural resources could include loss of historic properties eligible for listing on the National Register of Historic Places (NRHP). Under the Proposed Action, four of the 19 historic properties identified within the project area are anticipated to be adversely effected by development of mine facilities. Mitigation for direct effects to the four adversely affected sites would be developed and implemented in accordance with the Memorandum of Agreement (MOA) between the BLM, Nevada State Historic Preservation Office (SHPO) and HES. Two sites within a single historical property which remain unevaluated for NRHP eligibility are located within the APE but are located at least 50 meters outside of the proposed disturbance footprint and would require further evaluation. The remaining fourteen NRHP eligible historic properties located within the Area of Potential Effects (APE) are not within the proposed disturbance footprint but could be indirectly affected by construction or mining operations and surface exploration activities. To minimize the potential for illegal collection, vandalism, and inadvertent damage, HES would ensure that all its personnel and contractors are instructed on cultural resources avoidance and protection measures as part of its environmental training program.

Native American Traditional Values

During discussions with the BLM and HES, tribal representatives expressed concern about the potential for the Rossi Mine Expansion Project to result in the destruction of cultural sites and the loss of cultural traditions. Specifically, tribal representatives expressed concern over water loss, restriction of access to sites of tribal cultural value, restriction of access to hunting and plant gathering, visual and audible effects, and social effects resulting from loss of traditions.

Under the No Action Alternative, completion of the King North and King South WRDFs under current authorizations would continue to result in the covering of the two spring drainages and flow to the extent of the approved footprint for these WRDFs within the project area. Expansion of these WRDFs under the Proposed Action would also continue to cover both spring drainages and flow to the extent of the approved footprint for each WRDF. Under the Proposed Action, access to sites of tribal cultural value at the mine site would be limited or restricted due to mine safety requirements, preventing tribal members from gathering plants for ceremonies and medicine, hunting for wildlife, and accessing historic properties. Impacts, such as the avoidance of the area by wildlife and the removal of vegetation resources, within the project area important to the continuation of tribal hunting and gathering would occur under the Proposed Action until such time as reclamation is complete. Impacts to visual resources identified as important to tribal values and traditional customs would occur as a result of the Rossi Mine Expansion. HES proposes to use temporary and permanent lighting systems designed to reduce light emissions. HES would also reduce permanent visual impacts by reclaiming WRDFs to mimic the natural landforms and topography within and surrounding the project area.

Certain impacts to religious, spiritual, or sacred values and beliefs cannot be monitored or mitigated. If construction or other project personnel discover what might be human remains, then construction would immediately cease and the BLM Authorized Officer would be notified. The inadvertent discovery of human remains would follow the procedures stated in the Native American Graves Protection and Repatriation Act.

Through ongoing consultation and information sharing between the BLM and participating tribal representatives, three traditional cultural properties (TCP) located within the proposed PoO boundary, and a fourth TCP located mostly outside but adjacent to the proposed PoO boundary were identified. The three TCPs within the PoO boundary would be directly impacted by construction of mining facilities and limitations or removal of drivable access due to mining and exploration activity. All four TCPs identified by the BLM and tribal representatives would be indirectly affected by mine expansion, operation, mine closure, and reclamation activity.

Consultation regarding potential effects to any identified properties of traditional religious and cultural importance and grave/burial sites, is ongoing and would continue as long as it is needed. The consultation efforts have included information sharing, field visits, public scoping, and interviews conducted for the ethnography report prepared for the proposed project.

Hazardous Materials and Solid Waste

Hazardous materials and solid wastes delivered to or generated by the Rossi Mine Expansion would be transported by commercial carriers or vendors in accordance with the requirements of CFR Title 49. The probability of a release anywhere along the transportation route, within a populated area, or involving an injury or fatality is minimal.

Based on the facility's design features and the operational practices in place, the probability of a major release occurring at the site during the life of the mine would be low. Any release would be reported and mitigated according to federal and state law.

Air Quality

Air quality dispersion modeling results indicate that the mine site operations, ore haul traffic along gravel/dirt roads, and use of portable drill rigs associated with the proposed project would not exceed state or national ambient air quality standards for particulate matter with an aerodynamic diameter of 2.5 microns or less, particulate matter with an aerodynamic diameter of 10 microns or less, oxides of nitrogen, carbon monoxide, or sulfur dioxide for Rossi Mine site operations. Modeling also indicated that combined hazardous air pollutant (HAP) concentrations under the Proposed Action would be well below U.S. Environmental Protection Agency (USEPA) Reference Concentrations values. The Rossi Mine does not and would not process ores that contain mercury or use fuel that contains mercury. As a result, the Rossi Mine would not emit mercury. Greenhouse gas (GHG) emissions would contribute approximately 39,899 tons per year of GHGs for the Proposed Action.

Paleontological Resources

Recent surveys of the Carlin Formation within the vicinity of the proposed project and the Cumulative Effects Study Area have resulted in the collection of some recognizable vertebrate fossils. The Carlin Formation has a potential to contain scientifically significant fossils, especially vertebrates. Under the Proposed Action, general mining activities, waste rock disposal, and open pit development in the project area may result in the destruction, damage, or loss of fossils. No scientifically important vertebrate, invertebrate, or plant fossils have been reported during past exploration and development within the existing plan of operations boundary or project area of the Rossi Mine and the potential for future discovery or impacts to fossils is considered low.

Social and Economic Values

The proposed project would have a minor long-term impact upon population demographics in Elko, Lander, Humboldt, and Eureka counties. Expected employment levels at the Rossi Mine under the Proposed Action would increase to a total 433 employees or mining contractors during the operational life

of the mine. In addition to an increase and extension in Rossi Mine employment, the Proposed Action would also represent an expected increase in production and local expenditures. These increases in employment and expenditures are anticipated to have a positive impact upon the local economy during the 8-year period of mining operations.

In 2014 and 2015, the Rossi Mine paid an average of $88,700 in property taxes to Elko County. Because property taxes include net proceeds of minerals, the Proposed Action would not only extend the contribution of the Rossi Mine to local property taxes for the production period, but also increase the contribution to the extent that the volume of production increases.

Recreation and Wilderness

Expansion of existing operations at the Rossi Mine would reduce lands available for dispersed recreational activities in the project area by a total of 2,063 acres, of which 1,167 acres are proposed for new surface disturbance. The Proposed Action would result in minor traffic increases along Antelope Creek and Boulder Valley roads, which serve as the primary public access routes for recreational uses in the project vicinity. The development of the Dawn Pit and Dawn WRDF under the Proposed Action would remove a significant portion of the remaining undisturbed mule deer migration corridor situated between the existing Rossi and Arturo mines. Removal of the migration corridor is anticipated to have negative impacts on the local mule deer herd which in turn may result in a decrease in local hunting opportunity. The area between and immediately adjacent to the Rossi and Arturo mines has not been available to hunting for over the past 34 years due to the presence of active mining operations for human safety. The anticipated effects of the Proposed Action on wilderness resources in the study area would be negligible and in compliance with the Wilderness Act of 1964 and guidance in BLM Manual 6310 as the nearest wilderness study area and designated wilderness area are located approximately 23 and 55 air miles away, respectively. In addition, no direct or measurable indirect effects would occur to lands with wilderness characteristics.

Visual Resources

The primary visual impacts under the Proposed Action would occur through changes to local topography and landforms resulting from expansion and creation of the open pits and WRDFs. Development of the proposed project would expand the visual contrast that currently exists between existing mine facilities and the natural character of the landscape. Visual contrast effects under the Proposed Action would become less prominent over time during reclamation. Vegetated WRDF slopes would blend well with the surrounding landscape, under reclaimed conditions, resulting in a weak color and texture contrast. The moderate-to-weak visual contrasts in the anticipated post-mining and reclaimed conditions would be consistent with short- and long-term visual resource management (VRM) Class IV management objectives. Additional lighting utilized under the Proposed Action would result in very minimal changes in current lighting systems and is not anticipated to result in an appreciable increase in nighttime lighting levels or additional sky glow impacts.

Soils and Reclamation

Under the Proposed Action, approximately 2,063 acres of surface disturbance would result, including 1,167 acres of newly proposed disturbance. Therefore, approximately 2,063 acres of soils have the potential to be lost to erosion caused by wind and water. Other impacts could include changes in chemical and physical properties and reductions in biological activity of soils.

Revegetation of disturbance areas would be conducted as soon as practical to minimize impacts to soils and vegetation and facilitate post-mining land uses. A period of overall reclamation monitoring (and maintenance as necessary) is required prior to agency approval of reclamation. Major effects on the desired post-mining site productivity from soil quality impacts are not anticipated.

Vegetation, Including Riparian Zones and Wetland Areas

Under the Proposed Action, existing vegetation would be removed due to mining and exploration activities. Vegetation communities anticipated to be removed include approximately 46 acres of annual grassland, 1 acre of black sagebrush, 2 acres of low sagebrush, 2 acres of meadow, 866 acres of mixed

sagebrush (black sagebrush, Wyoming big sagebrush, and mountain sagebrush), 44 acres of mountain sagebrush/annual grassland, and 206 acres of previously disturbed lands, which is barren soil and has not been reclaimed or revegetated.

Riparian and Wetland Areas

Under the Proposed Action, the King North WRDF, based on its mapped extent, would result in less than 0.1 acre of disturbance to one wetland area (W-1). The Proposed Action would also disturb 0.8 acre of riparian vegetation. Exploration would not be conducted in riparian zones and wetland areas; therefore, impacts would be limited to potential increases in fugitive dust from exploration in adjacent upland areas and minor increases in sedimentation resulting from road and pad construction.

Noxious Weeds and Non-native Invasive Plant Species

Implementation of the measures outlined in HES's plan of operations modification and Noxious and Invasive Weed Management Plan would reduce the potential for noxious weeds and non-native invasive plant species establishment in the area. Measures to be implemented to prevent the spread of noxious weeds and non-native invasive plant species would include seeding growth media stockpiles as soon as practical with an interim seed mix, using certified weed-free hay and straw, mandatory on-site vehicle and equipment washing, and reclaiming disturbed areas with a BLM-approved seed mix. Noxious weeds and non-native plant species identified at the mine site would be removed by hand or chemically treated according to the Noxious and Invasive Weed Management Plan.

Range Resources

Expansion of existing operations at the Rossi Mine would result in 1,167 acres of new surface disturbance and a total of 2,063 acres of surface disturbance, which would reduce lands available for livestock grazing until they are reclaimed following the cessation of active mining activities. The 1,167 acres of surface disturbance under the Proposed Action are equivalent to a reduction of approximately 107 Animal Unit Months (AUM) in the Twenty-Five Allotment. Upon cessation of mining activities and successful completion of reclamation, suspended AUMs would be returned to active status as determined by the BLM. Permanent loss of AUMs resulting from the expansion of open pits that would not be reclaimed include approximately 194 acres or 18 AUMs.

The proposed project would result in the short-term loss of forage during facility construction, operation, and reclamation. It would result in a long-term loss of forage from the expansion of the open pits. Indirect impacts would include the potential spread of noxious weeds and non-native invasive plant species, and an increase in fugitive dust that could result in a reduction of forage and forage quality. The conversion of native vegetative communities and associated loss of forage could potentially be a permanent change resulting in a long-term impact.

Wildlife and Aquatic Biological Resources

Under the Proposed Action approximately 1,167 acres of new surface disturbance would result from mining activity. This proposed surface disturbance, in addition to the 896 acres of previously authorized disturbance would result in a total of approximately 2,063 acres being removed as available wildlife habitat.

Disturbance associated with the Proposed Action would be reclaimed, with the exception of 194 acres of expanded and new open pits that would not be backfilled and reclaimed. Indirect impacts would include increased noise, additional human presence, and the potential for increased vehicle-related mortalities.

The proposed project occurs within a mule deer migration corridor. Potential direct impacts to big game (mule deer, pronghorn, and elk) would include the incremental reduction of potential forage and the incremental increase in habitat fragmentation from vegetation removal associated with mine development and exploration activities. The Proposed Action would disturb approximately 1,167 acres of mule deer limited use range and movement corridor consisting primarily of sagebrush shrubland and steppe habitat. The 973 acres of mule deer limited use habitat would be considered short-term disturbance while 194 acres would be permanent surface disturbance.

Direct impacts to small game species (e.g., mourning dove and chukar) would include the short-term reduction of 973 acres and long-term reduction of 194 acres of potentially suitable habitat. Potential impacts would also include displacement from the disturbance areas and increased habitat fragmentation, until reclamation has been completed and vegetation is successfully re-established. Direct impacts to nongame species (e.g., small mammals, migratory birds, raptors, reptiles, and amphibians) would include the short-term reduction of 973 acres and the long-term reduction of 194 acres of potentially suitable habitat. The Proposed Action would result in decreased quality of habitat for raptor prey species due to changes in vegetation community composition, possible increase in invasive species, removal of vegetation, and destruction of animal burrows during mine development, which could result in reduced prey availability.

Habitat loss or alteration would result in direct losses of smaller, less mobile species of wildlife, such as small mammals, and the displacement of more mobile species into adjacent habitats. In areas where habitats are at, or near, carrying capacity, animal displacement could result in some unquantifiable reductions in local wildlife populations. Mine-related surface disturbance also would result in an incremental increase in habitat fragmentation at the mine site until vegetation has been re-established.

Due to a lack of high volume perennial flows from spring features within the proposed project area and an existing connection to perennial water bodies, it is unlikely that wetlands or riparian habitats within the study area support fish species. Erosion and sediment control measures as described in the Applicant Committed Environmental Protection Measures would be used to reduce sediment input from project facilities and disturbed areas into ephemeral channels within the project area that flow towards Boulder and Antelope creeks. By implementing the erosion control measures, project-related impacts created from sediment on tributaries to Boulder and Antelope creeks and aquatic biota are anticipated to be minor.

Special Status Species

Impacts to some special status species would include the removal of approximately 1,167 acres of potentially suitable habitat in addition to 896 acres of previously authorized disturbance for a total of 2,063 acres of habitat loss. Of the 1,167 acres of new disturbance, approximately 194 acres would be permanently lost as a result of the open pits that would not be reclaimed. Based on the limited habitat to be disturbed and available habitat in the vicinity, potential impacts to these species as a result of the proposed project would be low.

Section 3.18.1.3, Birds, provides details regarding the August 2014 and March 2015 greater sage-grouse habitat management categories included for analysis in this EIS. Under the August 2014 greater sage-grouse habitat management categories, approximately 679 acres of short-term disturbance and 125 acres of permanent disturbance would occur in greater sage-grouse Priority Habitat Management Area (PHMA); and 294 acres of short-term disturbance and 69 acres of permanent disturbance would occur in greater sage-grouse General Habitat Management Area (GHMA). Under the March 2015 greater sage-grouse habitat management categories approximately 689 acres of short-term disturbance and 133 acres of permanent disturbance would occur in greater sage-grouse PHMA; and 284 acres of short-term disturbance and 61 acres of permanent disturbance would occur in greater sage-grouse GHMA. Potential mitigation for the restoration of greater sage-grouse habitat may be conducted off-site at a ratio of 3:1 for acres of PHMA and 2:1 for acres of GHMA.

Ambient noise monitoring (Brennan and Associates 2015) and noise emission modeling (AECOM 2017a) were conducted to assess the potential for mining and exploration activities to impact greater sage-grouse at the Little Coyote Creek 12 lek located approximately 1.1 air miles to the northeast of the project area. Results of noise emission modeling indicate that under most atmospheric and mining activity scenarios, increases of noise levels experienced by greater sage-grouse at the Little Coyote Creek 12 lek would not exceed greater than 10 decibels on the A weighted scale (dBA). Noise modeling did identify the potential for exceedances of greater than 10 dBA at the Little Coyote Creek 12 lek under downwind conditions but concluded that the probability of these conditions existing during the period when greater sage-grouse would be actively displaying at the lek are very low and would not result in adverse impact to greater sage-grouse due to the increase in ambient noise levels when the sound of wind moving across local topography and vegetation is accounted for in the baseline ambient noise level.

Land Use and Access

Under the Proposed Action, surface disturbance for exploration and mining activities would increase by approximately 1,167 acres, for a total of 2,063 acres within the proposed PoO boundary and the Twenty-Five Allotment, reducing the area available for dispersed recreation and livestock grazing. Existing right-of-way authorizations within the proposed project boundary would not be affected or require relocation.

Sections of the Boulder Valley and Antelope-Boulder Connector roads would be realigned to maintain public access through the mine area. Approximately 2,890 feet of the Boulder Valley Road would be realigned to the east to allow expansion of the proposed QLC Pit, and approximately 2,879 feet of the Antelope-Boulder Connector Road would be realigned to the west for expansion of the King Pit. The realigned sections would be constructed prior to expansion of the pit so public access would be maintained at all times through the area.

Noise

Noise levels substantially higher than ambient background noise levels would be generated in close proximity to the main noise generating activity centers including the open pits, the WRDFs, the jig plant processing area, and mine traffic along the haul roads. Blasting within the open pits would only occur once a day during daylight hours and would be increasingly reflected upward by open pit walls as the pit depths increased, which would reduce the noise levels outside the pit.

Noise level effects from the proposed project would be negligible as no identified noise-sensitive receptors were identified in the noise effects study area, and relatively modest noise levels were estimated from project-related activities.

Environmental Justice

The environmental analyses indicate that the potential effects of the proposed project would not be expected to disproportionately affect any particular population. The area in the immediate vicinity of the proposed project has no resident population. The nearest residences are a few remote ranches located 7 air miles or greater from the project area and are not identified as minority or low-income in nature.

Energy Requirements and Climate Change

Under the Proposed Action, estimated annual production and emission of greenhouse gases (GHG) would include approximately 39,605 tons of carbon dioxide, 1.9 tons of methane, and 0.8 ton of nitrous oxide. These annual emissions represent a total of approximately 39,899 tons of carbon dioxide equivalent GHGs. In addition, the proposed project would indirectly emit approximately 837 tons of carbon dioxide through the consumption of 2,000,000 kilowatt hours of electricity on an annual basis. The total combined emissions from direct and indirect sources attributed to the proposed project is equivalent to 40,735 tons of carbon dioxide equivalent emissions.

The Proposed Action would emit GHGs that would incrementally add to GHG emissions in the region produced from other sources including power plants, mining activities, industrial operations, vehicle traffic, wildfires, livestock operations, and other emission producing activities. The proposed project represents less than 1 percent of the GHGs from all sources in the region, approximately 0.086 percent of the total projected emissions for Nevada in 2015. Therefore, the proposed project would be expected to have a negligible effect on climate.

BLM Preferred Alternative

The Council on Environmental Quality (CEQ) Regulations (40 CFR 1502.14e) direct that an EIS "identify the agency's preferred alternative or alternatives, if one or more exists, in the draft statement and identify such alternative in the final statement unless another law prohibits the expression of such a preference." The BLM has selected a preferred alternative based on the analysis in the EIS. The preferred alternative is the one that best fulfills the agency's statutory mission and responsibilities, considering economic, environmental, technical, and other factors. The Reconfiguration Alternative is

the BLM's preferred alternative for the Rossi Mine Expansion Project. The Reconfiguration Alternative includes the Proposed Action described in Chapter 2 and the plan of operations, with the exception of the changes for the WRDFs that were redesigned as described under the Reconfiguration Alternative in Chapter 2.

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ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
μeq/l	microequivalents per liter
$\mu g/m^3$	micrograms per cubic meter
AAQS	Ambient Air Quality Standards
ABA	acid-base accounting
ACHP	Advisory Council on Historic Preservation
AERMAP	AERMAP terrain preprocessor
AERMET	AERMET meteorological data preprocessor
AERMOD	AERMOD dispersion model
AFY	acre-feet per year
AGP	Acid Generating Potential
AIRFA	American Indian Religious Freedom Act
amsl	above mean sea level
ANP	Acid Neutralization Potential
APE	Area of Potential Effect
API	American Petroleum Institute
APLIC	Avian Power Line Interaction Committee
AQMA	air quality management area
AQS	Air Quality System
ARMPA	Approved Resource Management Plan Amendment
ARPA	Archaeological Resources Protection Act
ATF	Bureau of Alcohol, Tobacco, Firearms and Explosives
AUM	animal unit month
BAPC	Bureau of Air Pollution Control
BAQP	Bureau of Air Quality Planning
Baroid	Baroid Drilling Fluids, Inc.
Barrick	Barrick Gold Exploration Inc.
BBCS	Bird and Bat Conservation Strategy
BCC	Birds of Conservation Concern
BGEPA	Bald and Golden Eagle Protection Act
BGMI	Barrick Goldstrike Mines Inc.
bgs	below ground surface
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BLS	Bureau of Labor Statistics
BMP	Best Management Practice
BMRR	Bureau of Mining Regulation and Reclamation
BSU	Biological Study Unit
BVMP	Boulder Valley Monitoring Plan
BWPC	Bureau of Water Pollution Control
CAA	Clean Air Act
$CaCO_3$	calcium carbonate
CASTNet	Clean Air Status and Trends Network
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CESA	Cumulative Effects Study Area

cf	cubic feet
CFR	Code of Federal Regulations
cfs	cubic feet per second
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalents
CVFD	Carlin Volunteer Fire Department
dB	decibels
dBA	Decibels A-weighted scale
DCNR	Department of Conservation and Natural Resources
DEIS	Draft Environmental Impact Statement
DEM	Digital Elevation Model
DOI	Department of Interior
DPM	Diesel particulate matter
Dresser	Dresser Industries
dv	deciviews
EA	Environmental Assessment
EIS	Environmental Impact Statement
EMT	Emergency Medical Technician
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FLPMA	Federal Land Policy and Management Act of 1976
FR	Federal Register
FY	fiscal year
GHG	Greenhouse gas
GHMA	General Habitat Management Areas
GOED	Governor's Office of Economic Development
gpm	gallons per minute
GRSG	Greater Sage-Grouse
GRSG Amendment	Greater Sage-Grouse Approved Resource Management Plan Amendment
HA	Hydrographic Area
HAPs	hazardous air pollutants
HCT	humidity cell test
HDPE	High-density polyethylene
HES	Halliburton Energy Services
Hg	mercury
HPTP	Historic Properties Treatment Plan
Hz	Hertz
I-80	Interstate Highway 80
IDLH	Immediately Dangerous to Life or Health
IMPLAN	IMpact analysis for PLANning
IMPROVE	Interagency Monitoring of Protected Visual Environments
IUR	inhalation unit risk
Ka	Thousand years

kg	kilograms
kg/ha/yr	kilograms per hectare per year
kg/hectare	kilograms per hectare
KOP	key observation point
kV	kilovolt
LMP	Light Management Plan
LR2000	Land & Mineral Legacy Rehost 2000 System
m/s	meters/second
Ma	Million years
MACT	Maximum Achievable Control Technology
MBTA	Migratory Bird Treaty Act
MCL	Maximum Contaminant Level
MDN	Mercury Deposition Network
mg/L	milligrams per liter
mgd	million gallons per day
MMT	million metric tons
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MSA	Micropolitan Statistical Area
MSHA	Mine Safety and Health Administration
MT	million tons
MW	monitoring well
MWMP	meteoric water mobility procedure
NAAQS	National Ambient Air Quality Standards
NAC	Nevada Administrative Code
NADP	National Atmospheric Deposition Program
NAG	net-acid generation
NAGPRA	Native American Graves Protection and Repatriation Act
NDEP	Nevada Division of Environmental Protection
NDOM	Nevada Division of Minerals
NDCNR	Nevada Department of Conservation and Natural Resources
NDOT	Nevada Department of Transportation
NDOW	Nevada Department of Wildlife
NDWR	Nevada Division of Water Resources
NEI	National Emission Inventory
NEPA	National Environmental Policy Act of 1969
NESHAP	National Emission Standards for Hazardous Air Pollutants
Nevada AAQS	Nevada Ambient Air Quality Standards
NH_4^+	ammonium ion
NHPA	National Historic Preservation Act
NL	National Lead
NMCP	Nevada Mercury Control Program
NNEI	Newmont Nevada Energy Investment
NNP	net neutralization potential
NNRH	Northeastern Nevada Regional Hospital
NNRR	Northeastern Nevada Regional Railport and Industrial Park
NO_2	nitrogen dioxide
NO_3^-	nitrate ion

NOA	Notice of Availability
NOC	National Operations Center
NOI	Notice of Intent
NO_x	nitrogen oxides
NPR	neutralization potential ratio
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NRS	Nevada Revised Statute
NSPS	New Source Performance Standards
NSR	New Source Review
NTU	Nephelometric Turbidity Unit
NV	Nevada
NvBHA	Nevada Chapter of Backcountry Hunters and Anglers
NWS	National Weather Service
O_3	ozone
OHMA	Other Habitat Management Areas
OHV	off-highway vehicle
OHWM	Ordinary High Water Mark
OLM	Ozone Limiting Method
OSHA	Occupational Safety and Health Administration
P.L.	Public Law
PAG	Potentially Acid Generating
PCS	Petroleum-contaminated soils
PFYC	Potential Fossil Yield Classification
PHMA	Priority Habitat Management Areas
PIF	Partners in Flight
PM	Particulate Matter
PM_{10}	particulate matter less than 10 microns in diameter
$PM_{2.5}$	particulate matter less than 2.5 microns in diameter
PMF	probable maximum flood
PMU	Population Management Unit
PoO	Plan of Operations
ppb	parts per billion
ppm	parts per million
Proposed Action/project	Rossi Mine Expansion Project
PRISM	Parameter-elevation Relationships on Independent Slopes Model
PRPA	Paleontological Resources Preservation Act
PSD	Prevention of Significant Deterioration
PTE	potential to emit
PW	production well
QLC	Queen Lode Complex
QLEE	Queen Lode Eastern Extension
RCG	Rodeo Creek Gold
RCRA	Resource Conservation Recovery Act
RDFs	required design features
REA	Rapid Ecosystem Assessment
RELs	reference exposure levels

RfCs	reference concentrations
RFFA	reasonably foreseeable future actions
RMP	Resource Management Plan
ROD	Record of Decision
ROW	rights-of-way
RV	recreational vehicle
s.u.	standard units
SARA	Superfund Amendments and Reauthorization Act
SETT	Sagebrush Ecosystem Technical Team
SFA	Sagebrush Focal Area
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SLERA	Screening Level Ecological Risk Assessment
SOx	sulfur oxide
SO_2	sulfur dioxide
SO_4^-	sulfate ion
SPCCP	Spill Prevention Control and Countermeasures Plan
SR	State Route
SRA	State Recreation Area
SRK	SRK Consulting (U.S.), Inc.
SRMA	Special Recreation Management Area
SWPPP	Stormwater Pollution Prevention Plan
TCP	Traditional Cultural Property
TDS	Total Dissolved Solids
THPO	Tribal Historic Preservation Office
U.S.	United States
U.S.C.	United States Code
USACE	U.S. Army Corps of Engineers
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USDOT	U.S. Department of Transportation
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UUD	Unnecessary and Undue Degradation
VOC	volatile organic compound
VRM	Visual Resource Management
WPCP	Water Pollution Control Permit
WRCC	Western Regional Climate Center
WRDF	Waste Rock Disposal Facility
WSA	Wilderness Study Area
WSDP	Western Shoshone Defense Project
WW	Water Well

1.0 Introduction

1.1 Introduction and General Location

Halliburton Energy Services (HES) proposes to construct, operate, and reclaim the Rossi Mine Expansion Project (Proposed Action/project), which would include development of new facilities and expansion of previously disturbed barite mining areas at the Rossi Mine. The proposed project is on the northern end of the Carlin Trend in Elko County, Nevada, approximately 25 miles north of the town of Dunphy, as shown in **Figure 1-1**. The proposed project is on public land administered by the U.S. Department of the Interior (DOI), Bureau of Land Management (BLM), Elko District, Tuscarora Field Office.

The proposed project would be an expansion of the existing Rossi Mine, which is operated by HES under Plan of Operations (PoO) NVN-070547. The Rossi Mine is currently active; it has been mined using open-pit methods since 1947 by Halliburton or its predecessor, NL Baroid. Mining operations are conducted on private (patented) and unpatented mining claims controlled by Barrick Gold Exploration Inc. (Barrick) and leased to HES. The unpatented claims are on public lands managed by the BLM. The proposed project would be developed primarily on 1) public lands with existing disturbance from authorized mining activity, 2) on lands that have been reclaimed subsequent to disturbance from authorized mining activity, or 3) land that remains undisturbed. The proposed project would disturb a total of 2,063 acres of public and private land, including 896 acres of previously authorized or existing disturbance and 1,167 acres of new land disturbance. Of the 2,063 acres with surface disturbance, approximately 209 acres are privately owned; the remaining 1,854 acres are managed by the BLM.

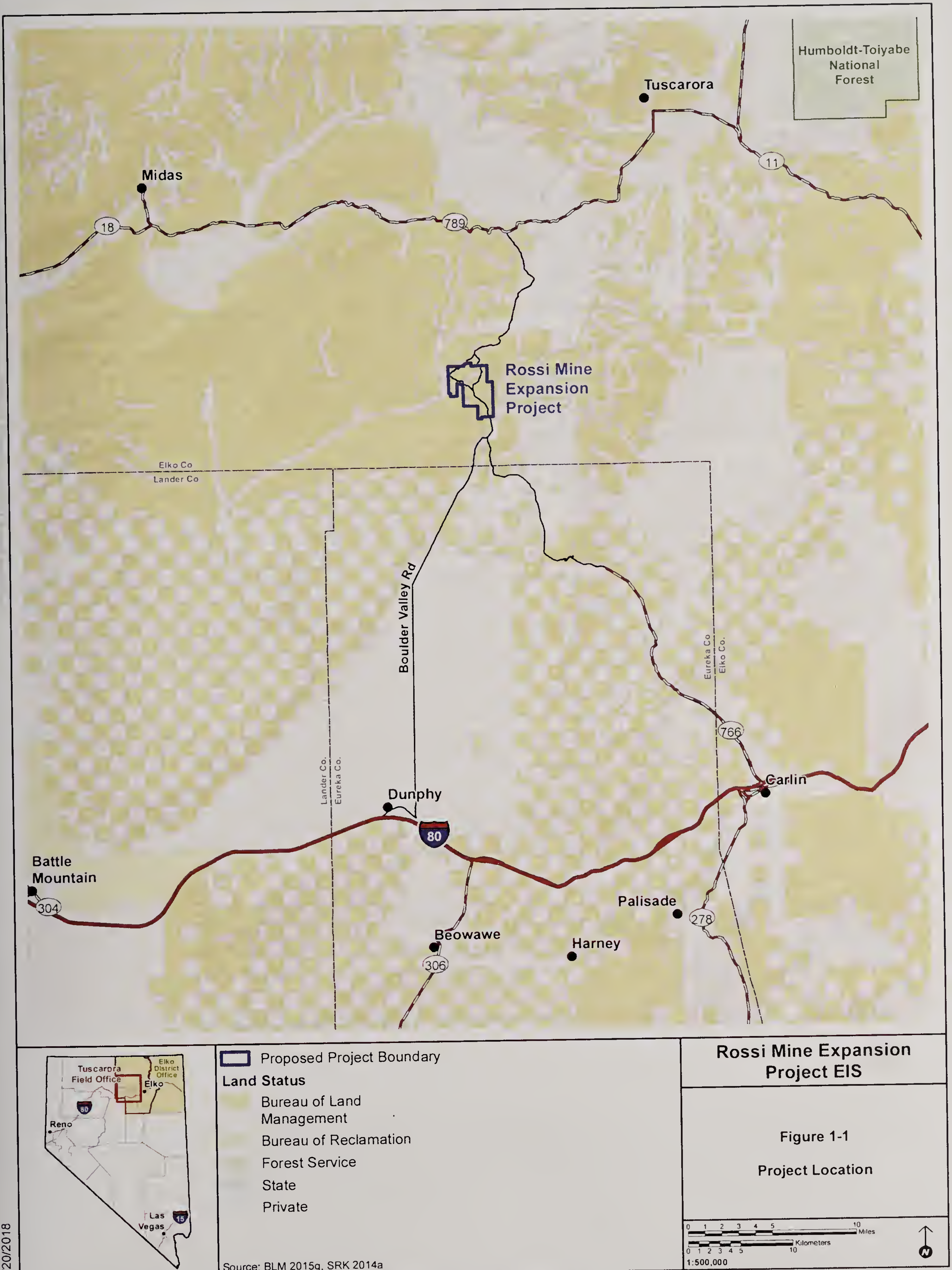
The proposed project includes:

- Expansion of the PoO boundary;
- Expansion of the existing King Pit;
- Expansion of the existing Queen Lode and Queen Lode Eastern Extension (QLEE) pits into the Queen Lode Complex (QLC) Pit;
- Development of the Dawn Pit;
- Expansion of the existing King North Waste Rock Disposal Facility (WRDF);
- Construction of three new WRDFs (QLC North, QLC East, Dawn);
- Expansion or improvement of existing ponds;
- Expansion or modification of support facilities;
- Expansion and development of new roads;
- Re-alignment of segments of the Boulder Valley Road and Antelope-Boulder Connector Road;
- Installation of new power distribution lines; and
- Continued surface exploration throughout the project area.

Under the proposed project, the ore mined from open pits would be transported to the on-site ore crusher and then either further processed at the on-site jig plant or direct shipped to the Dunphy grinding mill for grinding without jigging. Barite ore that is direct shipped to the Dunphy grinding mill would be shipped in either bulk containers or large bags using both truck and rail.

Barite ore that would be processed on-site at the Rossi Mine jig plant would be first separated from the jig tailings and then directly shipped by truck on the Boulder Valley Road to the HES grinding mill in Dunphy, Nevada, for further processing. After processing in Dunphy, refined barite would then be shipped from the Dunphy facility in bulk containers or large bags using truck or rail.

Under current authorizations, mining activity would continue at current production rates through 2018 within the King Pit and Queen Pit. Under the Proposed Action, mining activity would be extended at the Rossi Mine for an additional 8 years. To the extent possible, reclamation would occur concurrently with mining operations in areas where no further disturbance is anticipated.



Rossi Mine Expansion Project EIS

Figure 1-1

Project Location

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Original data were compiled from various sources. This information may not meet National Map Accuracy Standards.
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2/20/2018

Under the Proposed Action, mine closure and final reclamation would be completed during a 5-year period following cessation of mining in year 9. Post-closure monitoring by the Nevada Division of Environmental Protection (NDEP) – Bureau of Mining Regulation and Reclamation (BMRR) may continue for up to 30 years following completion of processing according to current regulations. The duration of the BLM's post-closure monitoring would depend on the project's final closure plan and its implementation; there are no time limitations under the current regulations. Post-closure monitoring would continue until reclamation objectives have been determined by BLM and NDEP-BMRR to have been successfully met by HES.

The Rossi Mine is located in Elko County, Nevada; therefore the proposed project is within the United States (U.S.) Geological Survey (USGS) Santa Renia Fields' 7.5-minute topographic quadrangle map area. **Figure 1-2** provides an overview of the surface land ownership of the proposed project area.

BLM approval is required for plan level activities that occur on public lands pursuant to the Federal Land Policy and Management Act of 1976 (FLPMA) (as amended), the BLM's surface management regulations (43 Code of Federal Regulations [CFR] Subpart 3809), and the BLM's regulations pertaining to use and occupancy under the mining laws (43 CFR Subpart 3715). The BLM also is required by the National Environmental Policy Act of 1969 (NEPA) to review the impacts of the overall proposal, including impacts on both public and private lands. The BLM has determined that an Environmental Impact Statement (EIS) must be prepared to fulfill the NEPA requirements.

Subpart 3715 of 43 CFR identifies the requirements for "use and occupancy of public lands for the development of locatable mineral deposits by restricting such use or occupancy to that which is reasonably incident." HES is required to meet the specific conditions outlined in 43 CFR Subpart 3715.3-2, as the Proposed Action would disturb a total of 1,854 acres of public land administered by the BLM in addition to 209 acres of privately owned land. Of the 2,063 acres of proposed surface disturbance, 896 acres of disturbance is previously authorized or existing disturbance, and 1,167 acres would be new surface disturbance.

The proposed PoO boundary may be fenced and/or signed to restrict public access. All fences and signs installed on public lands are subject to BLM approval and would not contain the phrase "No Trespassing". Access to the exploration and mining areas that are within the proposed PoO boundary and away from the public roads would require permission from HES in order to protect the public from potentially hazardous situations and to protect the mine facilities and equipment from vandalism or damage. Temporary fences and signs may be erected in some areas for safety, livestock exclusion, or to meet regulatory requirements. All fencing and signage located on public land would be approved by the BLM.

A programmatic Environmental Assessment (EA) for mining claim, mill site use, and occupancy for selected actions was completed by the BLM for the State of Nevada with a finding of no significant impact (BLM 2000a). The programmatic EA provides the basic analysis for the proposed use and occupancy of public lands. This EIS provides the site-specific analysis for the proposed project.

The BLM is serving as the lead agency for preparing the EIS in compliance with NEPA, the Council on Environmental Quality (CEQ) NEPA implementing regulations (40 CFR 1500-1508), the BLM's NEPA Handbook (H-1790-1), the Bureau-wide Guidelines for Assessing and Documenting Cumulative Impacts (BLM 1994), CEQ's Considering Cumulative Effects under NEPA (CEQ 1997a), and other applicable guidance. The Nevada Department of Wildlife (NDOW), Nevada Department of Conservation and Natural Resources (DCNR) Sagebrush Ecosystem Technical Team (SETT), U.S. Fish and Wildlife Service (USFWS), and the Elko County Board of Commissioners are serving as cooperating agencies for preparation and review of this EIS. The U.S. Environmental Protection Agency (USEPA) is participating in the project EIS review process similar to a cooperating agency based on the current Memorandum of Understanding (MOU) between the BLM and USEPA.

This EIS describes and analyzes the environmental consequences of the Proposed Action and proposed project alternatives, including the No Action Alternative. The No Action Alternative is to continue and complete previously authorized surface mining, reclamation, and closure activities at the Rossi Mine.

1.2 Current Status of the Rossi Mine

The Rossi Mine Expansion Project is a proposed expansion of the existing open pit barite mine that has been in operation since 1947. Disturbance has occurred at the mine site since 1947 for barite exploration and mining operations. The area has also been explored for gold by various companies.

1.3 History of Plans of Operation Associated with the Rossi Mine

Previous expansions at the Rossi Mine have been analyzed in the Rossi Mine EA (EA-NV-010-81-028, BLM 1981), Rossi Mine South Waste Rock Expansion EA (EA-NV-010-93-010, BLM 1993a), the Rossi Mine South Waste Rock Disposal Facility Expansion Project II EA (BLM/EK/PL-98/002, BLM 1998a), and the Rossi Mine Expansion EA (DOI-BLM-NV-N020-2010-0008-EA, BLM 2010a).

1.4 Purpose and Need for Action

The BLM's purpose is to respond to HES's proposed Rossi Mine Expansion Project PoO Modification and determine if the proposed action would create unnecessary or undue degradation of the public lands involved in the proposed action as defined by the 43 Code of Federal Regulations (CFR) 3809 Regulations. HES is proposing to expand their existing surface exploration and mining operations and develop new open pit barite mines on public lands. Barite is considered a locatable mineral. Segments of the Boulder Valley and Antelope Creek public access county roads would be re-aligned to allow for expansion of mining activities, including the development of new WRDFs and ancillary facilities.

The BLM's need for the action is to make a decision whether to approve, approve with modifications, require mitigation or deny HES's proposed project. The BLM is required to respond to HES's proposed project to conduct surface exploration and mining operations for locatable minerals in accordance with the Surface Management Regulations (43 CFR 3809), the Use and Occupancy Under the Mining Laws Regulations (43 CFR 3715), and other applicable laws such as FLPMA and NEPA. The NEPA mandates that the BLM evaluate or analyze the environmental impacts of the proposed project and reasonable alternatives (including the No Action Alternative), and consider and evaluate appropriate mitigation measures.

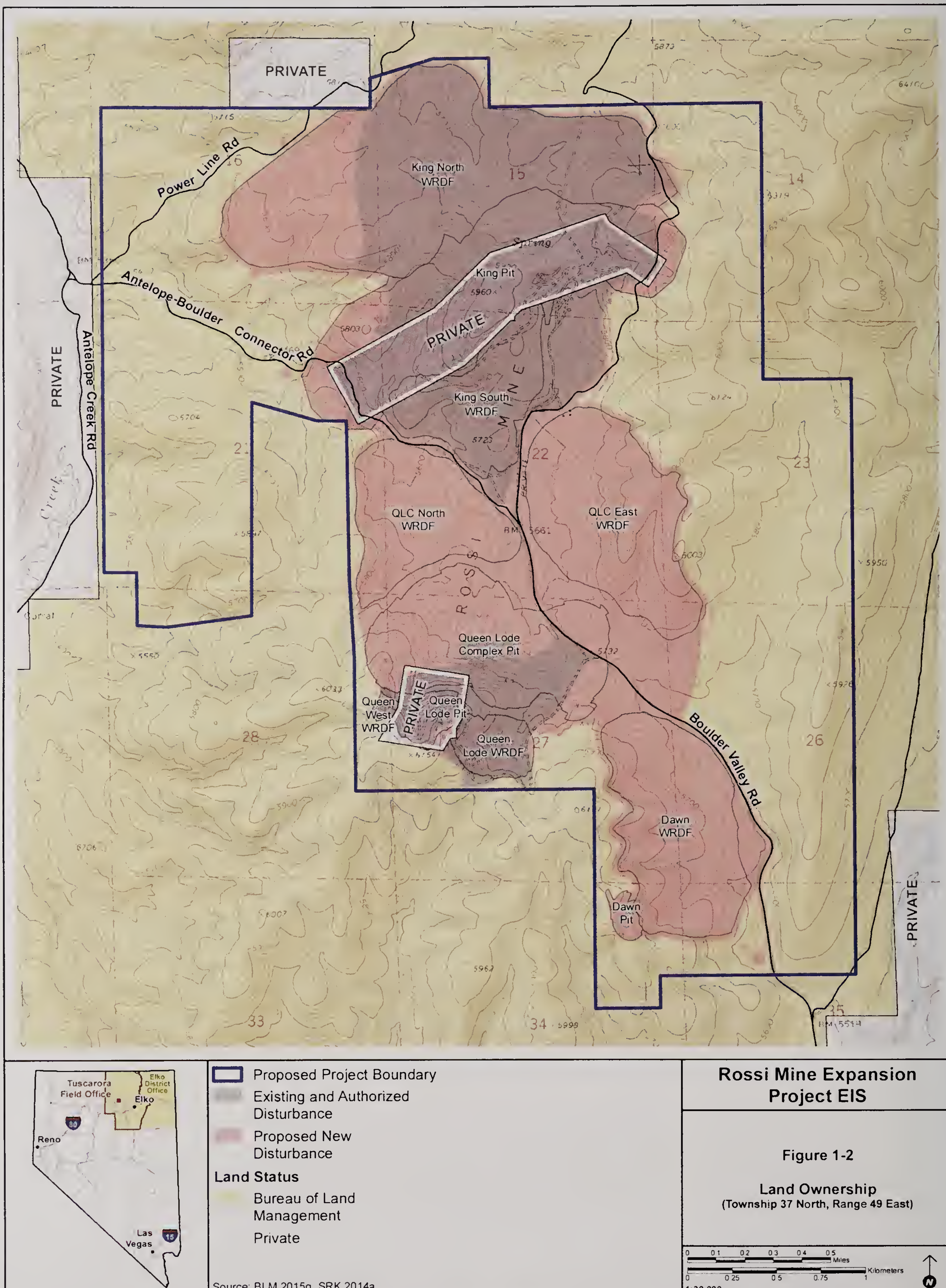
1.5 Relationship to BLM and Non-BLM Policies, Plans, and Programs

1.5.1 Land Use Conformance

The BLM has the responsibility and authority to manage the surface and subsurface resources on public lands located within the BLM's jurisdiction, and has designated the lands within the project area as open to entry for locatable minerals.

The Proposed Action and alternatives described in this document are in conformance with the Elko Resource Area Resource Management Plan (RMP), Issue – Minerals, Management Prescription – 1 (BLM 1987a) and are consistent with federal, state, and local laws, regulations, and plans.

The proposed project also is consistent with the Nevada and Northeastern California Greater Sage-Grouse Approved Resource Management Plan Amendment (ARMPA) (BLM 2015a). The BLM prepared this ARMPA to identify and incorporate appropriate measures in existing land use plans. It is intended to conserve, enhance, and restore greater sage-grouse (*Centrocercus urophasianus*) habitat by avoiding, minimizing, or compensating for unavoidable impacts on greater sage-grouse habitat in the context of the BLM's multiple use and sustained yield mission under FLPMA (BLM 2015a). Appendix A, Project Consistency with Greater Sage-grouse Approved Resource Management, provides a summary table of the management direction or required design features (RDFs) from the ARMPA, whether or not the measure is applicable to the project, and whether the proposed project is consistent with the measure. Additional details supporting the consistency of the proposed Project with the ARMPA is provided in Appendix A, Project Consistency with Greater Sage-grouse Approved Resource Management.



Rossi Mine Expansion Project EIS

Figure 1-2

Land Ownership
(Township 37 North, Range 49 East)

10/12/2017

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Original data were compiled from various sources. This information may not meet National Map Accuracy Standards.
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1.5.2 State and Local Land Use Plans and Policies

The State of Nevada's 1986 Statewide Policy Plan for Public Lands section on Mineral Resources states the Goals for Mineral Resources as: recognize that the development of Nevada's mineral resources is desirable and necessary to the nation, the state, and particularly, to the rural counties of the state; retain existing mining areas and promote the expansion of mining operations and areas, while respecting other resource values; and develop policies and regulations that provide for the long-term availability and responsible development of Nevada's mineral resources (Nevada Division of State Lands 1986).

The State of Nevada recognizes that mining is an important contributor to the state's economy and encourages the development of mineral resources. In Nevada Revised Statute (NRS) 519A.010, the state policy toward mining and reclamation as defined by the legislature is:

> (a) The extraction of minerals by mining is a basic and essential activity making an important contribution to the economy of the state of Nevada;
>
> (b) Proper reclamation of mined land, areas of exploration and former areas of mining or exploration is necessary to prevent undesirable land and surface water conditions detrimental to the ecology and to the general health, welfare, safety and property rights of the residents of this state; and
>
> (c) The success of reclamation efforts in this state is dependent upon cooperation among state and federal agencies.

Elko County, in cooperation with the Nevada Division of State Lands, developed the Elko County Public Land Use and Natural Resource Management Plan (Elko County 2010). The Proposed Action is consistent with this plan that recognizes the economic importance of developing mineral resources within the county. Directive 14-1 states that it is the objective/goal of the Elko County Public Land Use and Natural Resource Management Plan to "...retain existing mining areas and promote the expansion of mining operations and areas not specifically withdrawn" (Elko County 2010). The Proposed Action is consistent with state and local land use plans and policies.

1.6 Environmental Review Process

During the NEPA decision making process, the public is encouraged to participate and provide input through multiple opportunities and venues. The initial step in the EIS process is to notify the public and other government agencies of the BLM's intent to prepare an EIS. The BLM published a Notice of Intent (NOI) to prepare an EIS for the proposed project in the *Federal Register* (FR) on September 9, 2015. The NOI included a summary of the proposed project, information on public scoping, and project contact information.

The purpose of public scoping activities is to actively solicit and acquire input from the public and other interested federal, state, tribal, and local agencies or entities about the proposed project. Information received during public scoping helps the agencies identify potential environmental issues, social, economic, cultural issues/impacts, alternatives, and mitigation measures associated with the development of the proposed project. The process provides a mechanism for focusing and clarifying the issues so the EIS can address and analyze the primary areas of concern. Section 4.1, Public Participation and Scoping, provides detailed information regarding public scoping conducted for the proposed project.

After completion of the public scoping period, the BLM prepares a Draft EIS to analyze and address environmental effects associated with the Proposed Action and alternatives, including the issues and concerns identified during the scoping process. After the Draft EIS is published through a Notice of Availability (NOA) in the FR, the public has the opportunity to comment on the EIS during a 45-day public comment period. During the public comment period, the BLM conducts one or more public meetings. Comments can be submitted at the public meetings by filling out comment forms. The public also may submit comments to the BLM via mail, facsimile, and e-mail. The e-mail address for submitting comments is blm_nv_eldo_rossimine_project_eis@blm.gov. Before including your address, phone number, email address, or other personal identifying information in your comment, you should be aware that your entire comment, including your personal identifying information, may be made publicly available at any time.

Although you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so. The Final EIS includes responses to all substantive public comments received on the Draft EIS. The Final EIS is published through a NOA in the FR, and the public has the opportunity to review the Final EIS for a 30-day review period. Following the 30-day review period, the BLM issues the Record of Decision (ROD) for the EIS.

1.7 Project Permits and Approvals

In addition to the EIS, implementing the Proposed Action would require authorizing actions from other federal, state, and local agencies with jurisdiction over certain aspects of the proposed project. **Table 1-1** lists the required permits or approvals already in place or that would be obtained or otherwise addressed and the regulatory agencies responsible for issuing and managing such permits and approvals. HES is responsible for amending existing permits and applying for and acquiring additional permits and approvals, as needed.

Table 1-1. Major Permits and Approvals

Permit/Approval	Granting Agency
EIS PoO Approval	BLM
Explosives Permit	U.S. Bureau of Alcohol, Tobacco, and Firearms (ATF)
Federal Communications Commission (FCC) Form 620 for Communications Tower	FCC
Section 106 National Historic Preservation Act Compliance	BLM and State of Nevada Historic Preservation Office (SHPO)
Spill Prevention Control and Countermeasures Plan Storm Water General Permit	NDEP/Bureau of Water Pollution Control (BWPC)
Water Pollution Control Permit #NEV2015112	NDEP/BMRR
Reclamation Permit No.0257	NDEP/BMRR
Permit to Appropriate Water	Nevada Division of Water Resources (NDWR)
Air – Permit to Operate AP 3295-3753	NDEP/Bureau of Air Pollution Control (BAPC)
Hazardous Materials Storage Permit	State of Nevada; Fire Marshal Division
Construction Applications/Building Permits	County
Memorandum of Agreement for Maintenance of the Boulder Valley Road	County

1.8 Summary of Key Issues

Key issues identified in the scoping process associated with the Proposed Action include:

- Potential impacts to air quality from project emissions;
- Potential impacts to wildlife and associated habitat including mule deer migration corridors, migratory birds, raptors;
- Potential impacts to special status species such as greater sage-grouse, including threatened, endangered and candidate species;
- Potential impacts to public access;
- Potential impacts to cultural resources and Native American traditional values;

- Potential impacts to livestock grazing and range;
- Potential impacts to visual resources;
- Potential impacts to surface water and ground water quality; and
- Cumulative impacts.

Table 1-2 summarizes the comments received during the public scoping process. When applicable, this table identifies the resource affected and/or the chapter in the document where the comments or subject matter has been addressed. Some comments received during scoping are opinions, generic statements, or informational statements and are included in this table to document the receipt of the comment. When possible, the reader has been directed to the resource affected and/or chapter in this document that discusses the subject matter. In some cases, because of the nature of the comment, the table has been left blank because the comment is self-explanatory; therefore, it has not been responded to in this document and does not need a response. Other comments in **Table 1-2** that will not be addressed in the document do need an explanation for not addressing them in the document; therefore, a footnote or an explanation has been inserted into the right-hand column of the table explaining why the comment is not addressed in the document.

The CEQ regulation 40 CFR 1502.2(b) directs that the discussion of impacts is to be proportionate to their significance. CEQ regulation 40 CFR 1502.15 directs that the description of the affected environment is to be no longer than necessary to understand the effects of the alternatives.

Table 1-2. Public Scoping Comments Received during the Scoping Period

Comment Letter #	Commenter	Paragraph #	Comment	Resource Affected	Section Comment Addressed in the EIS	Additional Notes
RM-PSC-001-2015 1007	Jay Gatten	1	I strongly support the Rossi Mine Expansion Project. Better do it sooner, rather than later.			
RM-PSC-001-2015 1007	Jay Gatten	1	No need to study this project in depth or detail. It is an expansion of an operating mine.			
RM-PSC-001-2015 1007	Jay Gatten	1	We need oil and gas and we need barite to drill those resources. We need to use lands for the best use and I have to believe this would be the best use for lands in the Rossi Mine area.			
RM-PSC-001-2015 1007	Jay Gatten	1	An EIS should not have been required. The plans were submitted in 2014 – Sad it takes so long to figure things out.			
RM-PSC-001-2015 1007	Jay Gatten	1	We need jobs and the local economy should be on the top of the list when considering activities on Public lands.	Social and Economic Values	Chapter 3.0, Section 3.10	
RM-PSC-001-2015 1007	Jay Gatten	1	Thank you for the opportunity to comment on the project.			
RM-PSC-002-2015 1016	Julie Ernstien (Nevada State Historic Preservation Office)	1	Thank you for distributing the Bureau of Land Management notice (ELKO 2015-033) that it is seeking public input regarding the proposed expansion of the Rossi Mine, in Elko County, Nevada, and that it will be preparing an Environmental Impact Statement (EIS) for that undertaking.		Chapter 1.0	
RM-PSC-002-2015 1016	Julie Ernstien (Nevada State Historic Preservation Office)	1	The State Historic Preservation Office (SHPO) previously negotiated a Memorandum of Agreement (MOA) in 2010 for mitigation of adverse effects associated with a previous expansion of operations (UT2010-0184), and awaits word from the BLM regarding a federal agency decision regarding additional consultation, amendment of that MOA (as/if appropriate), and/or negotiation of a new Agreement Document (if warranted) for the proposed new action, once defined.	Cultural Resources	Chapter 3.0, Section 3.5	
RM-PSC-002-2015 1016	Julie Ernstien (Nevada State Historic Preservation Office)	1	We appreciate the notification that an EIS will be forthcoming, and look forward to working with the BLM, the project proponent, and other consulting parties to see that Section 106 obligations are successfully met.	Cultural Resources	Chapter 3.0, Section 3.5	

Table 1-2. Public Scoping Comments Received during the Scoping Period

Comment Letter #	Commenter	Paragraph #	Comment	Resource Affected	Section Comment Addressed in the EIS	Additional Notes
RM-PSC-003-2015 1001	Nevada Division of Environmental Protection, Bureau of Water Pollution Control	1	The project may be subject to BWPC permitting. Permits are required for discharges to surface waters and groundwater's of the state (Nevada Administrative Code NAC 445A.228). BWPC permits include, but are not limited to, the following: • Stormwater Industrial General Permit • De Minimis Discharge General Permit • Pesticide General Permit • Drainage Well General Permit • Temporary Permit for Discharges to Groundwater's of the State • Working in Waters Permit • Wastewater Discharge Permits • Underground Injection Control Permits • On-site Sewage Disposal System Permits • Holding Tank Permits			
RM-PSC-003-2015 1001	Nevada Division of Environmental Protection, Bureau of Water Pollution Control	1	Please note that discharge permits must be issued from this Division before construction of any treatment works (Nevada Revised Statute 445A.585).			
RM-PSC-003-2015 1001	Nevada Division of Environmental Protection, Bureau of Water Pollution Control	2	Additionally, the applicant is responsible for all other permits that may be required, which may include, but not be limited to: • Dam Safety Permits – Division of Water Resources • Well Permits – Division of Water Resources • 401 Water Quality Certification – NDEP • 404 Permits – U.S. Army Corps of Engineers • Air Permits – NDEP • Health Permits – Local Health or State Health Division • Local Permits – Local Government			

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RM-PSC-004-2015 1016	Jeffery Kindler (NDEP)	1	Halliburton Energy Services, Inc. currently holds Class II Air Quality Operating Permit AP3295-2080.01. Section VII of that operating permit addresses Surface Area Disturbance Conditions for 465 acres for Rossi Jig Plant. And, the facility has indicated that fugitive dust will be controlled in accordance with the dust control plan entitled "Dust Control Plan, Rossi Jig Plant, Halliburton Energy Services, Inc.", as submitted on January 23, 2006.		Chapter 1.0 and Chapter 2.0	
RM-PSC-004-2015 1016	Jeffery Kindler (NDEP)	1	If this new project is not covered by the current operating permit, Halliburton will need to submit a revision. Alternatively, Halliburton can apply for a standalone Surface Area Disturbance Operating Permit.			HES must conduct all operations in a manner that complies with all pertinent federal and state laws.
RM-PSC-004-2015 1016	Jeffery Kindler (NDEP)	1	Additionally, the mine may need to update their operating permit for new/expanded processes.		Chapter 1.0	
RM-PSC-005-2015 1020	Chris Mero (NV Backcountry Hunters & Anglers)	1	The Nevada Chapter of Backcountry Hunters and Anglers (NvBHA) has a great interest in and some grave concerns regarding the proposed expansion of the Rossi Mountain Mine. Our organization exists to work to conserve and/or restore large intact wildlife habitat. These are the key areas to maintain healthy wildlife populations and thus provide quality opportunities to hunters and fishers. Rossi Mountain is one such highly important area.	Recreation and Wilderness, Wildlife and Aquatic Biological Resources, Special Status Species	Chapter 3.0, Sections 3.11, 3.17, and 3.18	
RM-PSC-005-2015 1020	Chris Mero (NV Backcountry Hunters & Anglers)	1	Mine expansion will increase current regional impacts on wildlife.	Wildlife and Aquatic Biological Resources, Special Status Species	Chapter 3.0, Sections 3.17 and 3.18	
RM-PSC-005-2015 1020	Chris Mero (NV Backcountry Hunters & Anglers)	1	Statewide, mule deer populations have decreased and sage grouse populations are under threat. This area is of critical import to both these valuable species, as well as to the largest elk herd in our state, an exceptionally valuable resource.	Wildlife and Aquatic Biological Resources, Special Status Species	Chapter 3.0, Sections 3.17 and 3.18	

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Comment Letter #	Commenter	Paragraph #	Comment	Resource Affected	Section Comment Addressed in the EIS	Additional Notes
RM-PSC-005-2015 1020	Chris Mero (NV Backcountry Hunters & Anglers)	2	NvBHA submits the following comments and concerns for your consideration during the scoping process of the draft EIS. We will endeavor to provide more substantial comments once the draft document is released. Our issues are as follows:			
RM-PSC-005-2015 1020	Chris Mero (NV Backcountry Hunters & Anglers)	3	Re: seeps, springs & other water sources: these are known to be critical as stopover locations along mule deer migratory routes, of equal import to elk, as well as key for sage grouse (SG) brood-rearing. Some of these may be lost completely by mine dewatering activities. Mitigation measures should be outlined for any loss of this resource. Monitoring of spring flows is essential with adaptive management steps specified for potential impacts. Any loss of water sources must be replaced by guzzlers at places designated by NDOW and constructed well before water source is lost.	Water Resources and Geochemistry; Wildlife and Aquatic Biological Resources; Special Status Species	Chapter 3.0, Sections 3.4, 3.17, and 3.18	
RM-PSC-005-2015 1020	Chris Mero (NV Backcountry Hunters & Anglers)	4	Re: SG habitat: the area within sphere of influence of the mine and proposed expansion includes 3 leks; abandonment is a potential impact. Further, the entire area is comprised of half core habitat and half priority habitat. These habitats are quite simply irreplaceable, even by mitigation measures. Mitigation at best minimizes loss.	Special Status Species	Chapter 3.0, Section 3.18 and Appendix A	
RM-PSC-005-2015 1020	Chris Mero (NV Backcountry Hunters & Anglers)	5	Re: elk/mule deer/SG habitat mitigation: other projects have included off-site mitigation measures to compensate the public for loss of key wildlife habitat. For loss of mule deer winter range, crucial to herd survival, the compensation ratio has been 1:1. For SG, because negative impacts extend beyond the key habitat areas, the ratio has been 1:3. NDOW must be the key agency to consult as to the extent of areas lost/impacted, monetary value for those areas and design/location of habitat enhancement projects to be funded.	Wildlife and Aquatic Biological Resources, Special Status Species, Consultation and Coordination	Chapter 3.0, Sections 3.17 and 3.18, and Chapter 4.0	

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Comment Letter #	Commenter	Paragraph #	Comment	Resource Affected	Section Comment Addressed in the EIS	Additional Notes
RM-PSC-005-2015 1020	Chris Mero (NV Backcountry Hunters & Anglers)	6	Re: mule deer migration corridors: the mule deer population in Management area 6 has been greatly diminished in the past decade due to a number of factors including mine development that impairs migration corridors. Mine expansion threatens one of the last remaining corridors for the area 6 herd. To diminish the herd and/or their migration capabilities is a severe loss to contemplate, impossible to completely mitigate, will equate to an irreplaceable opportunity loss for hunters and have a resulting economic loss to local communities. This diminishing valuable resource deserves any development within the migration corridors to be minimized, but preferably eliminated.	Social and Economic Values, Recreation and Wilderness, Wildlife and Aquatic Biological Resources	Chapter 3.0, Sections 3.10, 3.11, and 3.17	
RM-PSC-005-2015 1020	Chris Mero (NV Backcountry Hunters & Anglers)	7	Re: potential elk impacts: The southern end pf the proposed expansion is critical elk winter range. Elk are particularly sensitive to sight and sounds of roads and/or other disturbance by mining activities. The potential impact would be that the elk move away and abandon a key area for their survival and resilience. The mine should work with NDOW to assess how to minimize disturbance by rerouting roads, moving locations of industrial activities to the degree possible, making seasonal or other timing adjustments for high level traffic. Such adjustments would benefit both mule deer and SG as well.	Wildlife and Aquatic Biological Resources	Chapter 3.0, Section 3.17	
RM-PSC-005-2015 1020	Chris Mero (NV Backcountry Hunters & Anglers)	8	Re: wildlife studies pre-expansion: up to date field study data must be collected on the mule deer migration routes within the area of influence of mine activities. To capture, fit and track mule deer with GPS collars is expensive and time consuming. The mine should be required to provide a cost share of that expense with NDOW. A baseline of elk populations utilizing the winter range within the project area must be completed predevelopment, with annual assessments and adaptive management when/where possible. The same must be conducted for the SG populations, both at leks and brood-rearing locations. This crucial steps are the only	Wildlife and Aquatic Biological Resources	Chapter 3.0, Section 3.17	

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			way to evolve a thoughtful plan of operations that proactively minimizes negative impacts and gives due value to wildlife concerns.			
RM-PSC-005-2015 1020	Chris Mero (NV Backcountry Hunters & Anglers)	9	While NvBHA fully recognizes and supports the important role of mining in Nevada, especially to our rural communities, there is no question that mining activities have negative impacts to our wildlife, a valuable resource, both economically and recreationally. Loss of key wildlife habitat can never be fully mitigated. It is our goal to minimize wildlife impacts by ensuring the most effective mitigation measures will be provided by this EIS.	Social and Economic Values, Wildlife and Aquatic Biological Resources	Chapter 3.0, Sections 3.10 and 3.17	
RM-PSC-006-2015 1009	Coalition for Nevada's Wildlife	1	The Coalition for Nevada's Wildlife hereby submits the following preliminary comments regarding the proposed Rossi Mine expansion. These comments are pertinent to the public scoping period and will be expanded and amended as project details evolve. The following issues should be addressed and mitigated in the EIS:			
RM-PSC-006-2015 1009	Coalition for Nevada's Wildlife	2	The existing mule deer migration corridor must be perpetuated in an undisturbed width of at least 3,000 feet. The Management Area 6 mule deer herd has plummeted from several factors including wildfire, invasive species, general loss of habitat, and mining development.	Wildlife and Aquatic Biological Resources	Chapter 3.0, Section 3.17	
RM-PSC-006-2015 1009	Coalition for Nevada's Wildlife	3	Migration routes must be carefully defined so that field studies involving fitting and tracking mule deer with GPS collars must be accomplished. The mine should be required to fund at least the cost of GPS collars.	Wildlife and Aquatic Biological Resources	Chapter 3.0, Section 3.17	
RM-PSC-006-2015 1009	Coalition for Nevada's Wildlife	4	Any destruction of mule deer or sage grouse habitat should be compensated by the mine for offsetting habitat improvement projects elsewhere in the management unit.	Wildlife and Aquatic Biological Resources, Special Status Species	Chapter 3.0, Sections 3.17 and 3.18	

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Comment Letter #	Commenter	Paragraph #	Comment	Resource Affected	Section Comment Addressed in the EIS	Additional Notes
RM-PSC-006-2015 1009	Coalition for Nevada's Wildlife	5	Springs or other water sources impacted by this expansion should be mitigated by construction of guzzlers in locations selected by NDOW.	Water Resources and Geochemistry, Wildlife and Aquatic Biological Resources	Chapter 3.0, Sections 3.4 and 3.17	
RM-PSC-006-2015 1009	Coalition for Nevada's Wildlife	6	The Coalition for Nevada's Wildlife represents the sportsmen of northwestern Nevada. Our directors are presidents, directors, or members of major sportsmen organizations. The Coalition also serves as a clearinghouse for sportsmen's and wildlife issues by coordinating with County Advisory Boards and sportsmen organizations statewide as well as the state legislature and our national delegation.			
RM-PSC-006-2015 1009	Coalition for Nevada's Wildlife	7	The Coalition supports mining and recognizes its importance to the economy of the state and particularly our rural counties. It must be understood that this proposed expansion will negatively impact wildlife resources; no level of mitigation can fully alleviate all impacts. It is our duty to minimize these impacts to a public resource with the most appropriate mitigation measures possible.	Social and Economic Values, Wildlife and Aquatic Biological Resources	Chapter 3.0, Sections 3.10 and 3.17	
RM-PSC-007-2015 1016	Sheldon Mudd (Nevada Governor's Office of Economic Development)	1	As the state agency charged with promoting a diverse and prosperous economy in the state of Nevada, which encourages the expansion and retention of businesses to the state. The Nevada Governor's Office of Economic Development (GOED) has conducted a review of HES proposal to expand the existing operations of its Rossi Mine in Elko County, Nevada, and is in full support of this initiative.			
RM-PSC-007-2015 1016	Sheldon Mudd (Nevada Governor's Office of Economic Development)	2	This project not only aligns with the core objectives of the Governor's Office of Economic Development, but also will help to sustain northeastern Nevada's regional economy for years to come with a workforce of 360 direct and indirect employees required to support an expansion project of this magnitude.	Social and Economic Values	Chapter 3.0, Section 3.10	

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RM-PSC-007-2015 1016	Sheldon Mudd (Nevada Governor's Office of Economic Development)	3	Prior to this expansion, GOED would encourage the Bureau of Land Management to conduct an Environmental Impact Statement to identify and address any potential ecological concerns. Rossi Mine has a 30-year history of placing a high importance on addressing the environmental, wildlife, and cultural impacts that might result from its expansions.	Multiple Resources	Chapter 1.0 and Chapter 3.0	
RM-PSC-007-2015 1016	Sheldon Mudd (Nevada Governor's Office of Economic Development)	4	GOED recognizes the Rossi Mine for its 68 years of consistent and sustainable production within the state of Nevada, and is confident that HES will continue to make reasonable accommodations when addressing any specific issues and/or concerns that may result from this expansion.			
RM-PSC-008-2015 1015	Greg Smith	1	My name is Greg Smith. I have lived in Nevada for over 50 years, 20+ in Battle Mountain. I have hunted and prospected in and around the Rossi Mine and understand the importance of mining in that area.			
RM-PSC-008-2015 1015	Greg Smith	1	However the decimation of the Mule deer and Sage grouse habitat in this area is beyond belief (due mostly to fires again and again).	Wildlife and Aquatic Biological Resources, Special Status Species	Chapter 3.0, Sections 3.17 and 3.18	
RM-PSC-008-2015 1015	Greg Smith	1	If nothing else the Deer need a travel way to migrate through this area. As I understand it the permit is asking for something much less than 3000'. Anything less than this should not be considered.	Wildlife and Aquatic Biological Resources	Chapter 3.0, Section 3.17	
RM-PSC-008-2015 1015	Greg Smith	1	Additionally any disturbance or change to water source must be addressed.	Water Resources and Geochemistry	Chapter 3.0, Sections 3.4 and 3.14	
RM-PSC-008-2015 1015	Greg Smith	1	I come from a mining background and understand the importance of this request but I also feel strongly that if our Deer herds and Sage grouse are to survive surely a compromise can be found.	Wildlife and Aquatic Biological Resources	Chapter 3.0, Section 3.17	
RM-PSC-009-2015 1009	Jamey Watt	1	Purpose and Need – EPA recommends the EIS include a clear description of the project's purpose and need. The EIS should adequately identify and describe the underlying need(s) for the project and the associated		Chapter 1.0	BLM regulations, policy, procedures, and guidance are followed in the preparation of this document.

Table 1-2. Public Scoping Comments Received during the Scoping Period

Comment Letter #	Commenter	Paragraph #	Comment	Resource Affected	Section Comment Addressed in the EIS	Additional Notes
			objectives or outcomes. Clear descriptions of project needs and objectives set the stage for thorough consideration of a range of alternatives and their effectiveness in meeting the needs and objectives of the project.			
RM-PSC-009-2015 1009	Jamey Watt (EPA)	2	Alternatives – The EIS should rigorously explore and objectively evaluate all reasonable alternatives, whether or not all such alternatives fall within the jurisdiction of the BLM (40 CFR 1502.14). The EIS should provide a clear discussion of the reasons for the elimination of alternatives which were not evaluated in detail. The document should discuss potential environmental impacts of the alternatives in comparative form, thus sharply defining the issues among the options for decision makers and the public (40 CFR 1502.14). The EIS should discuss the alternatives in the context of BLM's authorities under the Mining Law, the Federal Land Policy and Management Act, and other relevant statutes and regulations.		Chapter 2.0	
RM-PSC-009-2015 1009	Jamey Watt (EPA)	3	Mitigation – The EIS should thoroughly identify and describe appropriate mitigation measures associated with the project, specifying which ones would be committed to by the mine operator and/or required by the BLM or other federal, state, or local agency. The EIS should address how each measure would specifically mitigate the targeted impact, provide substantial detail on the means of implementing each mitigation measure, identify who would be responsible for implementing it, indicate whether it is enforceable, and describe its anticipated effectiveness. For some impacts, there may be several appropriate and effective measures. Conversely, some measures may turn out to be less effective than anticipated; therefore, implementation and effectiveness monitoring should be conducted and contingency measures should be considered and discussed. We recommend that for each impact area, the EIS describe the specific mitigation implementation thresholds, any mitigation implementation and	Multiple Resources	Chapter 3.0	

Table 1-2. Public Scoping Comments Received during the Scoping Period

Comment Letter #	Commenter	Paragraph #	Comment	Resource Affected	Section Comment Addressed in the EIS	Additional Notes
			effectiveness monitoring deemed necessary, and the criteria by which success would be determined once mitigation is fully implemented. Furthermore, for some mitigation measures, it may be necessary to describe the contingency planning and adaptive management options in place in the event that mitigation is found to be less than fully successful.			
RM-PSC-009-2015 1009	Jamey Watt (EPA)	4	Water Resources – Site Characterization The EIS should provide a complete hydrologic characterization of the project vicinity and the cumulative impact area, describing all existing water resources and baseline groundwater and surface water quality, quantity, flow regimes, and groundwater adjudication. Information on groundwater properties and groundwater/surface water connections (e.g., springs, seeps, interception of the water table by existing or proposed mine pits, etc.) are needed to identify and assess potential impacts to water resources and risks to receptors of contaminants. This baseline information is critical to understanding the project's potential environmental impacts and should be described in the EIS rather than included by reference.	Water Resources and Geochemistry	Chapter 3.0, Section 3.4	
RM-PSC-009-2015 1009	Jamey Watt (EPA)	5	Water Resources – The EIS should completely describe the current drainage patterns in the existing mine facilities and across the project area. The EIS should describe how drainage patterns would change (including post-closure drainage patterns) under each alternative. Include hydrologic and topographic maps of the project area and cumulative impact area. Identify any components of the proposed project that would fall within 25- and 100-year flood plains. Discuss the potential for runoff to transport sediment or contaminants from disturbed areas at the mine to any surface waters, as well as any potential receptors outside the mine boundaries.	Water Resources and Geochemistry	Chapter 3.0, Section 3.4	
RM-PSC-009-2015 1009	Jamey Watt (EPA)	6	Water Resources – EPA understands that some hydrologic and hydrogeologic characterization work has	Water Resources and Geochemistry	Chapter 3.0, Section 3.4	

Table 1-2. Public Scoping Comments Received during the Scoping Period

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			been completed for the Rossi Mine Expansion project, while some remains under development. We look forward to reviewing these materials and providing more specific recommendations based upon them once they are made available.			
RM-PSC-009-2015 1009	Jamey Watt (EPA)	7	Water Resources – Potential Impacts The EIS should discuss all direct, indirect, and cumulative impacts to surface water and groundwater quality and quantity from the proposed project and alternatives both during operations and after closure. The EIS should describe all potential project discharges, seepage, temporary ponding, diversions, and groundwater pumping, as well as the potential effects of these activities on water rights, water quality, water quantity, beneficial uses and wildlife. • Discuss the potential for contamination of meteoric water that contacts existing/approved and proposed waste rock, pit wall rock, stockpiles, roads, and other mine facilities. Analyze the fate and transport of any such water and discuss the possibility for wildlife exposure to mine influenced waters. • Assess and describe potential impacts to groundwater, surface water, and wildlife resulting from the formation a pit lake following mine closure. This analysis should include a thorough geochemical analysis of pit wall and groundwater chemistries, a comprehensive ecological risk assessment, and hydrogeological modeling demonstrating whether the pit lake would likely represent a perpetual sink, or whether through flow may occur. • Discuss the potential for and effects of movement of any contaminated surface water to the subsurface, including through the pit bottom. • Describe the projected chemical characterization of water in open ponds that would be located at the site. Describe the potential for such waters to enter	Water Resources and Geochemistry, Hazardous Materials and Solid Waste	Chapter 2.0 and Chapter 3.0, Sections 3.4 and 3.7	

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Comment Letter #	Commenter	Paragraph #	Comment	Resource Affected	Section Comment Addressed in the EIS	Additional Notes
			external surface water features. • Describe the designs of the proposed run-on/run-off channels, seepage collection systems, collection and sedimentation ponds, pump back systems, and any necessary treatment or disposal of these solutions. Depict these facilities on a map and describe all required monitoring/maintenance necessary to ensure proper functioning. • Describe all other mitigation measures to prevent contamination of water and sediment. • The EIS should discuss how accidental releases of hazardous materials would be handled. Identify the potential impacts of failure of the solution containment systems, methods for discovering such failures, and the degree to which impacts would be reversible. Describe the mine's petroleum-contaminated soil management plan.			
RM-PSC-009-2015 1009	Jamey Watt (EPA)	8	Water Resources – Monitoring The EIS should provide past and current monitoring results and trends for surface water and groundwater quality in the existing mine area. Discuss all ongoing and proposed monitoring plans and their relevance in predicting the potential for, and protecting against, contaminated drainage from existing/currently approved and future mine facilities.	Water Resources and Geochemistry	Chapter 3.0, Section 3.4	
RM-PSC-009-2015 1009	Jamey Watt (EPA)	9	Water Resources – Monitoring The EIS should describe procedures for water quality and quantity monitoring and reporting. The EIS should also describe procedures for monitoring the functioning of the waste rock dumps and stock piles in controlling contact between this material and surface or meteoric water (e.g., maintenance of run on/runoff channels, liners, underdrains, seepage collection areas, growth medium covers; ponding on top of facilities; etc.). Describe all monitoring locations for surface water, ponded water, and collected seepage; groundwater	Water Resources and Geochemistry	Chapter 2.0 and Chapter 3.0, Section 3.4	

Table 1-2. Public Scoping Comments Received during the Scoping Period

Comment Letter #	Commenter	Paragraph #	Comment	Resource Affected	Section Comment Addressed in the EIS	Additional Notes
			monitoring wells; and points of compliance on the site. The EIS should discuss monitoring frequencies, screening intervals, and parameters to be monitored during all phases of the project, including post-closure.			
RM-PSC-009-2015 1009	Jamey Watt (EPA)	10	Water Resources – Permitting The EIS should describe the applicable permits and state-adopted, EPA-approved water quality standards, including beneficial uses, in the project area, and discuss each alternative's compliance with the standards and permits. The EIS should provide the most up to date information with regard to any remediation activities requested or required by NDEP, BLM or other applicable regulating body pertaining to water quality and quantity management.	Water Resources and Geochemistry	Chapter 2.0 and Chapter 3.0, Section 3.4	
RM-PSC-009-2015 1009	Jamey Watt (EPA)	11	Water Resources – Permitting The EIS should discuss the applicability of Nevada's General Permit for Stormwater Discharges Associated with Industrial Activity from Metal Mining Activities to this project. The EIS should include a storm water pollution prevention plan and discuss specific mitigation measures that may be necessary during operations, closure, and post-closure. The EIS should describe the measures that would be employed to ensure the mine achieves and maintains a zero discharge status to surface waters and groundwater for all phases of the project.		Chapter 2.0	
RM-PSC-009-2015 1009	Jamey Watt (EPA)	12	Water Resources – Water Quantity and Supply The EIS should identify potential water sources and the amount of water needed for the project, and describe the potential impacts associated with using these sources. The EIS analysis should include hydrogeologic modeling describing and graphically depicting the cone of depression likely to result from both dewatering of the mine pit (if applicable) and well field pumping for supplemental water supply. The EIS should identify direct, indirect, and cumulative impacts to surface water	Water Resources and Geochemistry	Chapter 3.0, Section 3.4	

Table 1-2. Public Scoping Comments Received during the Scoping Period

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			flow, water supply wells, wetlands, springs and seeps, vegetation, wildlife, and other groundwater-dependent resources as a result of groundwater pumping associated with the proposed project. Describe and graphically depict post-closure groundwater elevation recovery.			
RM-PSC-009-2015 1009	Jamey Watt (EPA)	13	Water Resources – Clean Water Act Section 404 applicability BLM should coordinate with the U.S. Army Corps of Engineers to confirm that the project will not require a Clean Water Act Section 404 permit for discharge of dredged or fill material into waters of the United States, including wetlands and other "special aquatic sites." The EIS should describe the status of coordination with the Corps. If impacts to waters of the US are found, the EIS should specify acreages and channel lengths, habitat types, values, and functions of these waters. The EIS should describe the potential environmental impacts and discuss alternatives to avoid or minimize those discharges, and measures to mitigate potential impacts.	Water Resources and Geochemistry; Vegetation, Including Riparian Zones and Wetland Areas	Chapter 3.0, Sections 3.4 and 3.14	
RM-PSC-009-2015 1009	Jamey Watt (EPA)	14	Geochemistry – Accurate characterization of the mine's geochemistry is critical in properly identifying the project's potential impacts and addressing them through facility design and mitigation measures. The EIS should discuss the mine's geochemistry, including the neutralization/acid generation potential and non-acidic chemical leaching potential of the waste rock, pit wall rock, ore, and historic/existing mine workings. It should describe the static and humidity cell tests that have been conducted on ore and waste rock to characterize them, and provide a summary of the test results. The EIS should identify how the geochemical testing procedures were designed to comply with all applicable guidance and instructional memoranda.	Water Resources and Geochemistry	Chapter 3.0, Section 3.4	
RM-PSC-009-2015 1009	Jamey Watt (EPA)	15	Geochemistry – In addition to characterization, the EIS should describe how waste rock would be handled, disposed, and reclaimed at the mine. The EIS should	Water Resources and Geochemistry	Chapter 2.0 and Chapter 3.0, Section 3.4	

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Comment Letter #	Commenter	Paragraph #	Comment	Resource Affected	Section Comment Addressed in the EIS	Additional Notes
			describe facility designs and control measures that would be implemented to ensure against leaching and release of contaminants under both acidic and non-acidic conditions, and degradation of surface water and groundwater quality. This discussion should be supported with both with geochemical testing data and on-site current or historic monitoring data (recent monitoring results, pan evaporation rates, etc.).			
RM-PSC-009-2015 1009	Jamey Watt (EPA)	16	Air Quality – The EIS should describe existing air quality in the project vicinity. The EIS should discuss the National Ambient Air Quality Standards (NAAQS) and Prevention of Significant Deterioration (PSD) increments applicable to air quality in the project area. The EIS should discuss PSD applicability and whether a PSD permit might be required. The EIS should discuss impacts to the NAAQS and PSD increments from projected emissions of the project and alternatives, considering the effects from all aspects of mine exploration, excavation, construction, operation, and support activities, such as vehicle traffic, as well as cumulative emissions from other sources in the project area. BLM should closely coordinate with NDEP regarding regulatory requirements and controls.	Air Quality	Chapter 3.0, Section 3.8	
RM-PSC-009-2015 1009	Jamey Watt (EPA)	17	Air Quality – The EIS should summarize project emissions from all facilities and roads related to the mine's operations, including any off-site processing and support activities, such as vehicle traffic and delivery trucks for fuels, maintenance supplies, and other materials, as well as cumulative emissions from other sources in the project area. The EIS should include the air emissions resulting from the construction and operation of these facilities, including those resulting from right-of-way disturbance and road construction and use. Modeling should be conducted to determine concentrations of criteria air pollutants for an accurate comparison with the NAAQS.	Air Quality	Chapter 3.0, Section 3.8	

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RM-PSC-009-2015 1009	Jamey Watt (EPA)	18	Air Quality – PSD increments are highly protective of air quality in Class I areas such as wilderness areas and national parks. The EIS should identify all Class I PSD areas located within 100 kilometers of the proposed project site. Class I areas even farther away could potentially be affected as well. BLM should consult with the U.S. Forest Service and National Park Service for a determination of which areas could be adversely affected by the proposed action. Potential impacts to Class I PSD areas, including visibility impacts, should be discussed.	Air Quality	Chapter 3.0, Section 3.8	
RM-PSC-009-2015 1009	Jamey Watt (EPA)	19	Air Quality – The EIS should discuss mitigation measures to minimize air pollutant emissions from the mine, and include measures to address potential impacts to nearby residents, including sensitive receptors. Diesel particulate matter (DPM) and other criteria pollutants from fugitive sources at the mine can be reduced by implementing appropriate mitigation measures, such as the following: • Use particle traps and other appropriate controls to reduce emissions of DPM and other air pollutants. Traps control approximately 80 percent of DPM, and specialized catalytic converters (oxidation catalysts) control approximately 20 percent of DPM, 40 percent of carbon monoxide emissions, and 50 percent of hydrocarbon emissions; • Minimize construction-related trips of workers and equipment, including trucks and heavy equipment; • Lease or buy newer, cleaner equipment (1996 or newer model); • Employ periodic, unscheduled inspections to ensure that construction equipment is properly maintained at all times and does not unnecessarily idle, is tuned to manufacturer's specifications, and is not modified to increase horsepower except in accordance with established specifications.	Air Quality	Chapter 3.0, Section 3.8	

Table 1-2. Public Scoping Comments Received during the Scoping Period

Comment Letter #	Commenter	Paragraph #	Comment	Resource Affected	Section Comment Addressed in the EIS	Additional Notes
RM-PSC-009-2015 1009	Jamey Watt (EPA)	20	Air Quality – The EIS should discuss whether and how air quality monitoring would be implemented to ensure project compliance with all applicable air quality standards and permits.	Air Quality	Chapter 3.0, Section 3.8	
RM-PSC-009-2015 1009	Jamey Watt (EPA)	21	Hazardous Air Pollutants – The EIS should estimate releases of hazardous air pollutants (HAPs), including mercury, from the proposed project to air, soil, and water resources, including any off-site facilities instrumental to mine operations (i.e., any off-site ore processing). The EIS should list in detail all possible sources of HAPs and the unit processes that generate this material, including major processing equipment, including any thermal processing equipment.	Air Quality	Chapter 3.0, Section 3.8	
RM-PSC-009-2015 1009	Jamey Watt (EPA)	22	Hazardous Air Pollutants – The EIS should discuss how all HAPs would be controlled to reduce their emissions as much as possible. This discussion should identify measures and equipment that will be utilized to condense, capture, and/or treat HAPs. It should also discuss how these measures are effective in removing HAPs and making it unavailable for release into the environment and indicate how hazardous compounds would be disposed.	Air Quality	Chapter 3.0, Section 3.8	
RM-PSC-009-2015 1009	Jamey Watt (EPA)	23	Hazardous Air Pollutants – The EIS should describe the HAPs monitoring that would be conducted, including locations and reporting requirements.	Air Quality	Chapter 3.0, Section 3.8	
RM-PSC-009-2015 1009	Jamey Watt (EPA)	24	Climate Change – We believe the Council on Environmental Quality's December 2014 revised draft guidance for Federal agencies' consideration of GHG emissions and climate change impacts in NEPA outlines a reasonable approach, and we recommend that the BLM use that draft guidance to help outline the framework for its analysis of these issues. Accordingly, we recommend the draft EIS include an estimate of the GHG emissions associated with the project, qualitatively describe relevant climate change impacts, and analyze reasonable alternatives and/or practicable mitigation measures to reduce project-related GHG emissions.	Energy and Climate Change	Chapter 3.0, Section 3.22	

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			More specifics on those elements are provided below. In addition, we recommend that the NEPA analysis address the appropriateness of considering changes to the proposed design to incorporate GHG reduction measures and resilience to foreseeable climate change. The draft and final EIS should make clear whether commitments have been made to ensure implementation of design or other measures to reduce GHG emissions or to adapt to climate change impacts.			
RM-PSC-009-2015 1009	Jamey Watt (EPA)	25	More specifically, we suggest the following approach: "Affected Environment" Section • Include in the "Affected Environment" section of the draft EIS a summary discussion of climate change and ongoing and reasonably foreseeable climate change impacts relevant to the project, based on U.S. Global Change Research Program1 assessments, to assist with identification of potential project impacts that may be exacerbated by climate change and to inform consideration of measures to adapt to climate change impacts. "Environmental Consequences" Section • Estimate the GHG emissions associated with the proposal and its alternatives. Example tools for estimating and quantifying GHG emissions can be found on CEQ's NEPA.gov website2. If the project is likely to have less than 25,000 metric tons of CO2-e emissions/year, provide a qualitative estimate unless quantification is easily accomplished. In most cases quantification of GHG emissions involves a relatively straightforward calculation. The estimated GHG emissions can also serve as a reasonable proxy for climate change impacts when comparing the proposal and alternatives.	Energy and Climate Change	Chapter 3.0, Section 3.22	
RM-PSC-009-2015 1009	Jamey Watt (EPA)	26	Climate Change – CEQ's guidance recognizes that climate impacts are not attributable to any single action, but are exacerbated by a series of smaller decisions, we	Energy and Climate Change	Chapter 3.0, Section 3.22	

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			do not recommend comparing GHG emissions from a proposed action to global emissions. We also recommend that you do not compare GHG emissions to total U.S. emissions, as this approach does not provide meaningful information for a project level analysis. Consider providing a frame of reference, such as an applicable Federal, state, tribal or local goal for GHG emission reductions, and discuss whether the emissions levels are consistent with such goals.			
RM-PSC-009-2015 1009	Jamey Watt (EPA)	27	Describe measures to reduce GHG emissions associated with the project, including reasonable alternatives or other practicable mitigation opportunities and disclose the estimated GHG reductions associated with such measures. Attention should be paid to explaining the quality of each greenhouse gas mitigation measure – including its permanence, verifiability and enforceability. We offer the following potential measures for your consideration: • Use conveyors rather than haul trucks where possible, e.g., for transporting ore to processing areas and the heap leach facility; • Incorporate alternative energy components into the project such as on-site distributed generation systems, solar thermal hot water heating, etc.; • Incorporate recovery and reuse, leak detection, pollution control devices, maintenance of equipment, product substitution and reduction in quantity used or generated; • Include use of alternative transportation fuels, electric vehicles, etc., during construction and operation if applicable; • Commit to using high efficiency diesel particulate filters on new and existing diesel engines to provide nearly 99.9% reductions of black carbon emissions.	Energy and Climate Change	Chapter 3.0, Section 3.22	

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Comment Letter #	Commenter	Paragraph #	Comment	Resource Affected	Section Comment Addressed in the EIS	Additional Notes
RM-PSC-009-2015 1009	Jamey Watt (EPA)	28	Climate Change – In disclosing the potential impacts of the proposal and reasonable alternatives, we recommend the DEIS discuss whether and to what extent the impacts may be exacerbated by expected climate change in the area, as discussed in the "affected environment" section.	Energy and Climate Change	Chapter 2.0 and Chapter 3.0, Section 3.22	
RM-PSC-009-2015 1009	Jamey Watt (EPA)	29	The large-scale mine facilities proposed for this project will become permanent features of the landscape after closure. The DEIS alternatives analysis should, as appropriate, consider practicable design and management measures to ensure that the proposed mine is resilient to the anticipated effects of climate change (e.g., changes to storm magnitude or frequency, vegetation composition, evapotranspiration rates, etc.). For example, while a 100-year, 24-hour event may appear to be an appropriate standard for the operational and closure timeframe of mine facilities, we recommend that low probability events, such as the probable maximum flood (PMF) or, as appropriate, a recalculated PMF based on climate projections, be analyzed and considered in designing facilities for the long-term post-closure period. If facilities are not designed for resiliency, low probability events (e.g., a 500-yr event, rain-on-snow storm event, or a wet period preceding a large storm) could lead to slope failure and/or failed covers resulting in increased surface runoff and sedimentation and increased leachate reporting to post-closure evaporation cells. Such considerations are important to ensure that the closed facilities would be conservatively maintained and meet performance standards in perpetuity.	Energy and Climate Change	Chapter 2.0 and Chapter 3.0, Section 3.22	
RM-PSC-009-2015 1009	Jamey Watt (EPA)	30	EPA recommends that the Record of Decision commit to implementation of reasonable mitigation measures that would reduce or eliminate project-related GHG emissions and ensure climate adaptation/resiliency of project facilities.		Chapter 3.0, Section 3.22	

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Comment Letter #	Commenter	Paragraph #	Comment	Resource Affected	Section Comment Addressed in the EIS	Additional Notes
RM-PSC-009-2015 1009	Jamey Watt (EPA)	31	The BLM should work closely with the USFWS and the Nevada Division of Wildlife to determine potential impacts of the project on plant and wildlife species, especially species classified rare, threatened, or endangered on either state or federal lists. The EIS should provide the most up to date information available with regard to consultation with the U.S. Fish and Wildlife Service and the potential for impacts to special status species.	Wildlife and Aquatic Biological Resources, Special Status Species	Chapter 3.0, Sections 3.17 and 3.18	
RM-PSC-009-2015 1009	Jamey Watt (EPA)	32	The EIS should: • Identify all petitioned and listed threatened and endangered species and critical habitat, as well as sensitive species, that might occur within the project area; • Identify all species or critical habitat that could potentially be directly, indirectly, or cumulatively affected by each alternative; • Discuss how surveys were conducted for each species, their findings, and all follow-up surveys and monitoring that would be conducted before, during, and after mining occurs; • Include the biological assessment by reference or as an appendix, if one is prepared; and • If a biological opinion is prepared by the USFWS, it should be summarized or included as an appendix in the Final EIS to demonstrate that the preferred alternative is consistent with the biological opinion.	Special Status Species	Chapter 3.0, Section 3.18	
RM-PSC-009-2015 1009	Jamey Watt (EPA)	33	The EIS should discuss the mitigation measures that would be taken to minimize impacts to special status species, and prevent exposure of migratory waterfowl and other wildlife to any toxic solutions, spills, or mine influenced waters. The EIS should discuss the effectiveness of mitigation measures to protect wildlife, and indicate how they would be implemented and enforced. Describe maintenance requirements and monitoring to ensure their effectiveness.	Special Status Species	Chapter 3.0, Section 3.18	

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Comment Letter #	Commenter	Paragraph #	Comment	Resource Affected	Section Comment Addressed in the EIS	Additional Notes
RM-PSC-009-2015 1009	Jamey Watt (EPA)	34	The EIS should identify any non-jurisdictional wetland or riparian habitats adjacent to or within the project area. The EIS should describe how these waters have already been affected by existing operations, the extent to which the functions of these waters has been degraded and the extent to which each action alternative might further degrade or contribute to an improvement in the quality of these resources. The EIS should discuss measures for the avoidance, minimization, and mitigation of losses, and address strategies for improving the quality and quantity of these areas. If important habitat would be adversely affected by the proposed project, we recommend that the EIS include a detailed mitigation plan for habitat replacement, identifying: • Acreage and habitat type that would be created or restored; • Resources needed to maintain the mitigation area; • The revegetation plans including the numbers and age of each species to be planted; • Maintenance and monitoring plans, including performance standards to determine mitigation success; • The size and location of mitigation zones; • The parties that would be ultimately responsible for the plan's success; and • Contingency plans that would be implemented if the original plan fails.	Vegetation, including Riparian Zones and Wetland Areas	Chapter 3.0, Section 3.14	
RM-PSC-009-2015 1009	Jamey Watt (EPA)	35	Understanding reclamation, closure and post-closure design is critical to an understanding of the potentially significant environmental impacts of this project. The EIS analysis should describe in great detail the reclamation, closure and post-closure management of the proposed project.		Chapter 2.0, Section 2.3.12	

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Comment Letter #	Commenter	Paragraph #	Comment	Resource Affected	Section Comment Addressed in the EIS	Additional Notes
RM-PSC-009-2015 1009	Jamey Watt (EPA)	36	The EIS should describe and discuss the following components of mine reclamation: • A detailed account of measures that would be taken to decommission mine operations and stabilize and revegetate slopes, waste rock facilities, roads and other areas; • Identification (including estimated acreage) of the areas targeted for reclamation, and description of the intended degree of treatment in each area; • Timing of reclamation relative to mining operations, procedures for concurrent reclamation activities, and duration of reclamation treatment; • Standards for determining, and means of assuring, reclamation success; and • Means of assuring that all maintenance required for reclaimed areas would continue after operations cease or while operations are suspended.		Chapter 2.0, Section 2.3.12	
RM-PSC-009-2015 1009	Jamey Watt (EPA)	37	Closure – The EIS should describe all closure and post-closure activities associated with the waste rock areas and other facilities, including commitments by the mine company and agencies regarding operation and maintenance of caps/covers, draindown systems, fencing and wildlife protection measures, diversion channels, wells, etc. The EIS should describe implementation, performance, and effectiveness monitoring, and follow up actions that would be taken should destabilization or contamination be detected.		Chapter 2.0, Section 2.3.12	
RM-PSC-009-2015 1009	Jamey Watt (EPA)	38	Closure – The EIS should describe in detail how seepage from the waste rock piles would be prevented or captured, treated and controlled over the closure and post-closure period. The EIS should discuss the fate and transport any anticipated constituents from the waste rock piles over the course of closure and post-closure.		Chapter 2.0, Section 2.3.12	
RM-PSC-009-2015 1009	Jamey Watt (EPA)	39	Waste Rock Areas – The EIS should describe the reclamation and closure of the waste rock areas, including capping/covers, chemistry and fate of seepage		Chapter 2.0, Section 2.3.12	

Table 1-2. Public Scoping Comments Received during the Scoping Period

Comment Letter #	Commenter	Paragraph #	Comment	Resource Affected	Section Comment Addressed in the EIS	Additional Notes
			fluids, and projected drain down times. The EIS should assess the effectiveness of various cap/cover systems in reducing meteoric water flow through the waste rock areas. The EIS should describe the implementation, performance, and effectiveness monitoring, and follow up actions that would be taken should destabilization or contamination be detected.			
RM-PSC-009-2015 1009	Jamey Watt (EPA)	40	Growth Media Coverage – Reclamation and closure of the waste rock disposal areas will involve placing growth media over rock material to provide store and release covers for the purpose of reducing infiltration of meteoric water. The EIS should describe the availability, properties, and sources of cover material and/or growth media, discuss how it would be applied to disturbed areas, and identify any additional measures (e.g., amendments) that may be needed to ensure successful reclamation and revegetation of the project site. Cover design should be described in detail with supporting data to demonstrate anticipated effectiveness.		Chapter 2.0, Section 2.3.11	
RM-PSC-009-2015 1009	Jamey Watt (EPA)	41	Growth Media Coverage – The EIS should identify the permeability standard that growth media or other cover material would be designed to achieve, provide the basis for infiltration rates and cover/growth media thickness estimates, and discuss their effectiveness in minimizing exposure of mined material to meteoric water that could mobilize contaminants.	Water Resources and Geochemistry, Soils and Reclamation	Chapter 2.0, Section 2.3.11, and Chapter 3.0, Sections 3.4 and 3.13	
RM-PSC-009-2015 1009	Jamey Watt (EPA)	42	Revegetation – We recommend that revegetation be accomplished with only native species indigenous to the area in order to restore the ecosystem to as natural a state as possible after mine closure. We also recommend that revegetation success be monitored and enforced for at least 5 years following revegetation efforts.		Chapter 2.0, Section 2.3.12.5	
RM-PSC-009-2015 1009	Jamey Watt (EPA)	43	Reclamation/Closure Bonding – EPA recommends that the EIS discuss the reclamation bonding requirements and amounts for the proposed project and alternatives. The viability of the bond can be a critical factor in			X[1]

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Comment Letter #	Commenter	Paragraph #	Comment	Resource Affected	Section Comment Addressed in the EIS	Additional Notes
			whether a project is environmentally acceptable; therefore, this information should be disclosed in the Draft EIS. The EIS should also discuss how BLM could modify the bond during the course of operations if temporary, long-term, or perpetual treatment and/or remediation needs are discovered during operations. The EIS should describe bonding requirements and other measures that BLM and state regulators have in place to ensure funds would be immediately available should the mine operator or its insurer be unable to fund the required reclamation or closure activities.			
RM-PSC-009-2015 1009	Jamey Watt (EPA)	44	Long term Management and Financial Assurance – The EIS should describe all necessary long-term monitoring and management of the mine, as well as the enforcement mechanisms by either BLM or other regulators should the mine operator fail to properly follow the long-term post-closure plan. The EIS should describe the time frame over which long term management activities would occur or if they might be necessary into perpetuity.			X[1]
RM-PSC-009-2015 1009	Jamey Watt (EPA)	45	Long term Management and Financial Assurance – The EIS should indicate the projected costs for any post-closure activities, and discuss whether BLM would impose on the mine operator a requirement to establish a trust fund or other funding mechanism to ensure post-closure care, in accordance with 43 CFR 3809.552(c).			X[1]
RM-PSC-009-2015 1009	Jamey Watt (EPA)	46	Long term Management and Financial Assurance – If a long term funding mechanism is deemed necessary by the BLM, EPA recommends that the Draft EIS include a general description of the funding mechanism. Any financial assurance must be kept current as conditions change at the mine. The terms of the fund are critical to determining whether sufficient funds would be available to implement the post-closure plan and reduce the possibility of long-term contamination problems.			X[1]
RM-PSC-009-2015 1009	Jamey Watt (EPA)	47	Long term Management and Financial Assurance – The discussion in the Draft EIS should include the following			X[1]

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Comment Letter #	Commenter	Paragraph #	Comment	Resource Affected	Section Comment Addressed in the EIS	Additional Notes
			information: • Requirements for timing of payments into the trust fund; • How to ensure the trust fund would be bankruptcy remote; • Acceptable financial instruments (such as those specified in 43 CFR 3809.555); • Tax status of the trust fund; • Identity of the trust fund beneficiaries; and • Identity of the operator with responsibility/liability for financial assurance at this site.			
RM-PSC-009-2015 1009	Jamey Watt (EPA)	48	Long term Management and Financial Assurance – If the potential impacts of the project would necessitate a long-term trust fund, EPA believes this information is essential in the Draft EIS because it could make the difference between a project sufficiently managed over the long-term by the site operator, or an unfunded/under-funded contaminated site that becomes a liability for the Federal government. In the absence of an appropriate guarantee, EPA could consider a project unacceptable if it could result in unmitigated impacts exceeding environmental standards on a long-term basis.			X[1]
RM-PSC-009-2015 1009	Jamey Watt (EPA)	49	Environmental Justice – Executive Order 12898 on Environmental Justice addresses disproportionate adverse impacts of federal actions on minority and low-income populations. The EIS should identify minority and low-income populations potentially affected by the project, and address whether any of the alternatives would cause any disproportionate adverse impact, such as displacement, changes in existing resources or access, or community disruption. The document should also explore potential mitigation measures for any adverse environmental justice effects. The EIS should describe the measures taken by the BLM to: (1) fully analyze the environmental effects of the proposed Federal action on minority communities and low-income	Environmental Justice	Chapter 3.0, Section 3.21	

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			populations; and (2) present opportunities for affected communities to provide input into the NEPA process. The EIS should state whether the analysis meets requirements of BLM's environmental justice strategy.			
RM-PSC-009-2015 1009	Jamey Watt (EPA)	50	Government-to-Government Consultation – We recommend that the EIS discuss BLM's consultation with all Native American tribal governments that could be potentially affected by the proposed project or may have resources (e.g., traditional cultural properties, groundwater resources) that could be affected. The principals for interactions with tribal governments are outlined in an April 29, 1994, presidential memorandum and Executive Order 13175, dated November 6, 2000. It is important that formal government-to-government consultation take place early in the scoping phase of the project to ensure that all issues are adequately addressed in the EIS. Where feasible, efforts should be made to avoid or mitigate impacts to culturally significant sites.	Cultural Resources, Native American Traditional Values	Chapter 3.0, Sections 3.5 and 3.6, and Chapter 4.0	X[2]
RM-PSC-009-2015 1009	Jamey Watt (EPA)	51	Cumulative Impacts – According to the CEQ regulations implementing NEPA, a cumulative impact is "...the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." [40 CFR 1508.7].	Multiple Resources	Chapter 2.0 and Chapter 3.0	
RM-PSC-009-2015 1009	Jamey Watt (EPA)	52	Cumulative impacts analyses are important to the EIS as they describe the threats to resources as a whole. Understanding cumulative impacts can illuminate opportunities for minimizing those threats. The EIS should describe the potential cumulative impacts associated with the proposed project and alternatives, as well as the methodology used to assess them. This would include consideration of project impacts in the	Multiple Resources	Chapter 2.0 and Chapter 3.0	

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			cumulative context of any and all impacts associated with Rossi Mine.			
RM-PSC-009-2015 1009	Jamey Watt (EPA)	53	Guidance on how to analyze cumulative impacts has been published by the CEQ 3 and EPA.4 In addition, you may also wish to refer to http://www.dot.ca.gov/ser/cumulative_guidance/ purpose.htm. This cumulative impact guidance was prepared by the California Department of Transportation, the Federal Highway Administration, and EPA Region 9 for transportation projects in California. However, the principles and the 8-step process in this guidance can be applied to other types of projects, and outside of California. We recommend the principles and steps in this guidance to other agencies as a systematic way to analyze cumulative impacts for their projects.	Multiple Resources	Chapter 3.0	BLM regulations, policy, procedures and guidance are followed in the preparation of this document.
RM-PSC-009-2015 1009	Jamey Watt (EPA)	54	We have the following recommendations for structuring cumulative impacts analyses: • The description of the affected environment should focus on each affected resource or ecosystem. Determination of the affected environment should not be based on a predetermined geographic area, but rather on perception of meaningful impacts and natural boundaries. • Focus on resources of concern, i.e., those resources that are "at risk" and/or are significantly affected by the proposed project, before mitigation. Identify which resources are analyzed, which ones are not, and why; • Identify all other on-going, planned, and reasonably foreseeable projects in the study area. While the existing Coeur Rochester operations and their impacts to date should certainly be analyzed, all other mining projects and non-mining activities in the project area which may contribute to cumulative impacts should also be assessed and considered. Where studies exist on the environmental impacts of these other projects, use these studies as a source for quantifying cumulative impacts;	Multiple Resources	Chapter 3.0	Although the CEQ provides regulations and procedures for the implementation of NEPA, each federal agency has developed regulations or procedures that govern the specifics of its NEPA process. Therefore, as the lead agency for this project, this document follows BLM regulations, policy, procedures and guidance for implementing NEPA and the CEQ Regulations.

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			• Include appropriate baselines for the resources of concern with an explanation as to why those baselines were selected; and • When cumulative impacts occur, mitigation should be proposed. Clearly state who will be responsible for mitigation measures and how mitigation implementation will be ensured.			
RM-PSC-010-2015 1006	Jon McClendon	-	No Comments. Letter was used to request inclusion of commenter on project mailing list and to receive a CD copy of the DEIS.			
RM-PSC-011-2015 1016	Rozilyn Jones	1	I'm totally against this expansion. The expansion further desecrates and destroys this area that is tied to the culture of the Shoshone and Paiute people to include other tribes who gathered material for the making of spears, arrows, and knives.			
RM-PSC-011-2015 1016	Rozilyn Jones	1	Furthermore, the dewatering and use of chemicals will adversely impact the environment and water in this area.	Water Resources and Geochemistry	Chapter 3.0, Section 3.4	
RM-PSC-012-2015 1030	Rollie Wilson (Western Shoshone, Te-Moak Tribe, Battle Mountain Band Counsel)	1	The Battle Mountain Band of the Te-Moak Tribe of Western Shoshone (Band) is among the tribes and bands that signed the 1863 Treaty of Ruby Valley. Today the Band resides on Colony Lands on the western side of Battle Mountain, Nevada. The Band's Colony Lands were established by Executive Order and Statute.			
RM-PSC-012-2015 1030	Rollie Wilson (Western Shoshone, Te-Moak Tribe, Battle Mountain Band Counsel)	2	The Band has significant interests in natural and cultural resources on public lands in the area of HES' proposed Project. The Project overlaps with and will impact the Tosawihi Quarries and other individual natural and cultural resources utilized by the Band since time immemorial. The Band considers the entire area Tosawihi Quarries area to be a Traditional Cultural Landscape.	Cultural Resources, Native American Traditional Values	Chapter 3.0, Sections 3.5 and 3.6	

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RM-PSC-012-2015 1030	Rollie Wilson (Western Shoshone, Te-Moak Tribe, Battle Mountain Band Counsel)	3	Band received an "Interested Party" letter from the BLM dated September 28, 2015 regarding preliminary scoping for the Project. As you know, the Band is not an "Interested Party." Rather, the Band is one of four Bands of the Te-Moak Tribe of Western Shoshone a federally recognized tribe. BLM is required to consult with the Band on a government-to-government basis and must uphold its treaty and trust responsibilities to the Band.	Consultation and Coordination	Chapter 4.0	X[2] Scoping for the NEPA process is open to any affected or interested party and the public. Scoping involves notification of the proposed action to affected and interested parties and the public. It also provides opportunities for feedback to the BLM from other agencies, organizations, tribes, local governments, and the public.
RM-PSC-012-2015 1030	Rollie Wilson (Western Shoshone, Te-Moak Tribe, Battle Mountain Band Counsel)	4	The requirements for BLM's government-to-government consultation with the Band are outlined in Executive Order No. 13,175 Consultation and Coordination with Indian Tribal Governments (Nov. 6, 2000) (Executive Order on Consultation), and the Department of the Interior Policy on Consultation with Indian tribes (Dec. 1, 2011) (Interior Consultation Policy). In particular, both the Executive Order and Interior's Policy, require BLM to consult with the Band "as early as possible" when considering a Departmental action with tribal implications. See Interior Consultation Policy at 11.			X[2]
RM-PSC-012-2015 1030	Rollie Wilson (Western Shoshone, Te-Moak Tribe, Battle Mountain Band Counsel)	5	In this case, BLM should have met with the Band a month or so ago, provided an explanation of the Project and initiated a discussion regarding issues and resources need to be studied and assessed under the NEPA and the National Historic Preservation Act (NHPA). The Band could have provided comments at that time to assist BLM with outreach on the Project and scoping under NEPA. This initial discussion would have also informed the Band's comments on BLM's scoping for the Project.	Native American Traditional Values	Chapter 3.0, Section 3.6	

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RM-PSC-012-2015 1030	Rollie Wilson (Western Shoshone, Te-Moak Tribe, Battle Mountain Band Counsel)	6	The Band is pleased to provide these preliminary scoping comments as a part of the public comment period, however, the Band also expects that BLM will follow up with the Band and other tribes to conduct government-to-government consultation outside of the public process under NEPA. For example, once BLM receives preliminary scoping comments from the public and has a chance to review the comments, BLM should provide the Band with an outline or draft and provide the Band with time to review and comment on the draft scoping document. BLM should follow this process for each step and document prepared in its NEPA review. In general, government-to-government consultation cannot be limited by public comment periods.			Government-to-government consultation is not a NEPA process. However, it is a separate process that may be initiated, conducted concurrently, and integrated into the NEPA process to provide the decision maker with a more comprehensive assessment or evaluation of a proposed action with respect to the concerns of the Native American people. Government-to-government consultation for a project does not have time limitations; therefore, it may end or continue into the future for an undetermined amount of time.
RM-PSC-012-2015 1030	Rollie Wilson (Western Shoshone, Te-Moak Tribe, Battle Mountain Band Counsel)	7	An ethnographic study of the area of potential effects is among the most important assessments that BLM can do to understand the impacts of the Project on the Band and cultural and natural resources important to the Band. An ethnographic study will provide BLM with information that can be used to fulfill NEPA as well as the NHPA. The Band appreciates BLM's consultation with us on selection of an ethnographer this study.	Native American Traditional Values	Chapter 3.0, Section 3.6	An ethnographic study has been completed for the project. Information from this study has been incorporated into the EIS in Chapter 3.0 Section 3.6.
RM-PSC-012-2015 1030	Rollie Wilson (Western Shoshone, Te-Moak Tribe, Battle Mountain Band Counsel)	8	An ethnographic study of the area of potential effects should provide a full year for the study time period. A year is needed to understand the season uses of the area by the Band and other tribes. Studying the area of a year will allow for first-hand observation of the tribal cultural and natural resources, and ongoing uses of those resources, by the Band and other tribes.	Native American Traditional Values	Chapter 3.0, Section 3.6	An ethnographic study has been completed for the project. Information from this study has been incorporated into the EIS in Chapter 3.0 Section 3.6.

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RM-PSC-012-2015 1030	Rollie Wilson (Western Shoshone, Te-Moak Tribe, Battle Mountain Band Counsel)	9	An ethnographic study of the area should also include extensive interviews with members of the Band and other tribes. The vast majority of knowledge of the area's cultural and natural resources, and how these resources were utilized is passed on from generation to generation through oral history and training in the field. The Band is concerned that merely relying on existing studies and information will perpetuate problems that have occurred in the permitting of other mines. In particular, this information ignores the ongoing uses of the area by the Band and other tribes, and only recognizes the archeological value of resources.	Native American Traditional Values	Chapter 3.0, Section 3.6	An ethnographic study has been completed for the project. Information from this study has been incorporated into the EIS in Chapter 3.0 Section 3.6.
RM-PSC-012-2015 1030	Rollie Wilson (Western Shoshone, Te-Moak Tribe, Battle Mountain Band Counsel)	10	The September 28, 2015 letter listed a handful of preliminary issues that BLM identified for scoping. BLM's list included: cultural resources, Native American traditional values, hydrology and wildlife. The Band agrees that potential impacts to these resources should be assessed in BLM's NEPA document. However, this is only a beginning list. Below the Band provides a number of other natural and cultural resources that should be assessed for the proposed Project. The Band looks forward to reviewing BLM's draft scoping document and discussing the analysis needed for each of these resources.			
RM-PSC-012-2015 1030	Rollie Wilson (Western Shoshone, Te-Moak Tribe, Battle Mountain Band Counsel)	11	Groundwater hydrology: BLM should address potential impacts to groundwater caused by groundwater drawdown, discharge, recharge, and mitigation.	Water Resources and Geochemistry	Chapter 3.0, Section 3.4	
RM-PSC-012-2015 1030	Rollie Wilson (Western Shoshone, Te-Moak Tribe, Battle Mountain Band Counsel)	12	Groundwater quality: BLM should address potential impacts to groundwater caused by contamination, geochemistry changes, and mitigation.	Water Resources and Geochemistry	Chapter 3.0, Section 3.4	

Table 1-2. Public Scoping Comments Received during the Scoping Period

Comment Letter #	Commenter	Paragraph #	Comment	Resource Affected	Section Comment Addressed in the EIS	Additional Notes
RM-PSC-012-2015 1030	Rollie Wilson (Western Shoshone, Te-Moak Tribe, Battle Mountain Band Counsel)	13	Surface water hydrology: BLM should address potential impacts to surface water hydrology as they relate to watersheds, including the Antelope Creek and Humboldt River watersheds, spring, stream and river flows, ponds and lakes, mine water discharges, runoff, erosion and sedimentation, and mitigation.	Water Resources and Geochemistry	Chapter 3.0, Section 3.4	
RM-PSC-012-2015 1030	Rollie Wilson (Western Shoshone, Te-Moak Tribe, Battle Mountain Band Counsel)	14	Surface water quality: BLM should address potential impacts to surface water quality as they relate to contamination, changes in the chemistry of natural waters, temperature, dissolved oxygen, sediments, treated mine wastewater, and mitigation.	Water Resources and Geochemistry	Chapter 3.0, Section 3.4	
RM-PSC-012-2015 1030	Rollie Wilson (Western Shoshone, Te-Moak Tribe, Battle Mountain Band Counsel)	15	Aquatic resources: BLM should address potential impacts on fish and aquatic ecosystems, the impacts of contaminants and change in flows, and mitigation.	Water Resources and Geochemistry; Vegetation, Riparian Zones, and Wetlands; Wildlife and Aquatic Biological Resources	Chapter 3.0, Sections 3.4, 3.14, and 3.17	
RM-PSC-012-2015 1030	Rollie Wilson (Western Shoshone, Te-Moak Tribe, Battle Mountain Band Counsel)	16	Air quality: BLM should address potential impacts on air quality as it relates to particulates, chemical emissions and changes, and radioactivity. Particulate issues include impacts from dust, and other ore and waste handling facilities, and heavy metals. Chemical emission issues include impacts from heavy metals causing acid rain, chemicals and reagents used in ore processing, and odors associated with the project. BLM should also assess radioactivity impacts on air quality from the project.	Air Quality	Chapter 3.0, Section 3.8	
RM-PSC-012-2015 1030	Rollie Wilson (Western Shoshone, Te-Moak Tribe, Battle Mountain Band Counsel)	17	Archaeological resources: BLM should address potential impacts to historically and culturally significant archaeological resources. The proposed Project overlaps with the Tosawihi Quarries which includes tool scatters, fragments of stone implements, by-products of tool-making activities, clay sources, rock shelters, village sites, projectile points. Historic issues include impacts on	Cultural Resources	Chapter 3.0, Section 3.5	

Table 1-2. **Public Scoping Comments Received during the Scoping Period**

Comment Letter #	Commenter	Paragraph #	Comment	Resource Affected	Section Comment Addressed in the EIS	Additional Notes
			other National Register eligible sites located along transportation and utility corridors, and impacts from mine wastewater discharges and erosion. Cultural issues include cultural resource impacts on property controlled by the mine, on burial sites, and along transportation and utility corridors, and impacts from mine wastewater discharges. Archaeology issues include impacts on property controlled by the mine, on archaeological properties along transportation and utility corridors, and on archaeological resources from erosion.			
RM-PSC-012-2015 1030	Rollie Wilson (Western Shoshone, Te-Moak Tribe, Battle Mountain Band Counsel)	18	Historic and traditional cultural properties: BLM should address potential impacts to cultural places and properties, burial sites, plants, water, and other natural resources used for cultural and religious purposes, and the customs and traditions of the Band and other tribes. These potential impacts include impacts to both natural resources used for subsistence, ceremonial feasting, medicinal, economic, craft production and religious purposes, as well as the structures, objects, sites, traditional cultural properties, paintings, carvings, and human remains that have cultural significance. They further include impacts to Antelope Creek and other water bodies, sites eligible for the National Register. In particular, BLM should assess impacts to the Tosawihi Quarries as a Traditional Cultural Landscape. The Quarries are a traditional homeland of the Western Shoshone, including the Band. The Band and other Indian tribes utilized, and continue to utilize, the Tosawihi Quarries as an economic, cultural and religious area since time immemorial. BLM's analysis must assess impacts to the Quarries as a unified landscape as opposed to isolated resources.	Native American Traditional Values	Chapter 3.0, Section 3.6	

Table 1-2. Public Scoping Comments Received during the Scoping Period

Comment Letter #	Commenter	Paragraph #	Comment	Resource Affected	Section Comment Addressed in the EIS	Additional Notes
RM-PSC-012-2015 1030	Rollie Wilson (Western Shoshone, Te-Moak Tribe, Battle Mountain Band Counsel)	19	Indian trust resources: BLM should address potential impacts to issues related to water, fishing, hunting, gathering, and other resources protected by treaty rights and the federal trust responsibility. Water issues include impacts on the Band and other tribes' reserved water rights, contamination of water from a leak or spill, and other trust resources related to water. Fishing issues include impacts on subsistence, harvest and ceremonial use of fish and other aquatic resources, contaminants affecting fish and other aquatic resources, and other trust resources related to fishing, fish and other aquatic resources. Hunting issues include impacts on subsistence, harvest and ceremonial use of game animals, contaminants affecting game and other wildlife species, and other trust resources related to hunting and wildlife species. Gathering issues include impacts on subsistence, harvest and ceremonial use of plants and medicines.	Multiple Resources	Chapter 3.0, Sections 3.6, 3.14, and 3.17	An internet search was completed to find quantifiable information regarding harvesting and gathering of plant and animals by the Western Shoshone people in Nevada; no data or information is available.
RM-PSC-012-2015 1030	Rollie Wilson (Western Shoshone, Te-Moak Tribe, Battle Mountain Band Counsel)	20	Visual resources: BLM should address potential impacts to aesthetics and visual resources. Aesthetic issues include impacts on the Antelope Creek watershed and impacts from mine development and night lighting. Visual impact issues are focused on changes that the proposed mine facilities would have on local residents, the Band and other tribal members who use the area for cultural, religious and subsistence purposes.	Visual Resources	Chapter 3.0, Section 3.12	
RM-PSC-012-2015 1030	Rollie Wilson (Western Shoshone, Te-Moak Tribe, Battle Mountain Band Counsel)	21	Noise: BLM should address potential noise impacts from mining activities, construction and operation of new roads and locating noise generators near sensitive receptors such as wildlife, birds, and sites used for cultural, religious and subsistence purposes.	Native American Traditional Values, Wildlife and Aquatic Biological Resources, Special Status Species, Noise	Chapter 3.0, Sections 3.6, 3.17, 3.18 and 3.20	

Table 1-2. Public Scoping Comments Received during the Scoping Period

Comment Letter #	Commenter	Paragraph #	Comment	Resource Affected	Section Comment Addressed in the EIS	Additional Notes
RM-PSC-012-2015 1030	Rollie Wilson (Western Shoshone, Te-Moak Tribe, Battle Mountain Band Counsel)	22	Transportation: BLM should address potential impacts on highway and air transport systems. Highway transport issues include impacts from transporting hazardous materials, potential spills, increased traffic through the Tosawihi Quarries, and along the Interstate 80 corridor, and upgrading and maintaining roads. Air transport issues include impacts from air and helicopter traffic and air space over the Band's Colony Lands, other colony lands and areas used for cultural, religious and subsistence purposes.	Land Use	Chapter 3.0, Section 3.19	The Federal Aviation Administration regulates and manages air space and air traffic, which is outside the jurisdiction of the BLM and the scope of this document.
RM-PSC-012-2015 1030	Rollie Wilson (Western Shoshone, Te-Moak Tribe, Battle Mountain Band Counsel)	23	Mineral resources: BLM should address potential impacts on existing mineral rights and claims, on ore bodies adjacent to the proposed mine site, and impacts from mining and processing unanticipated elements.	Geology and Minerals	Chapter 3.0, Section 3.3	
RM-PSC-012-2015 1030	Rollie Wilson (Western Shoshone, Te-Moak Tribe, Battle Mountain Band Counsel)	24	Socioeconomics: BLM should address potential impacts on economics, industries, services, the Band and other tribal communities, employment, population, housing and property, and tax revenue and expenditures.	Social and Economic Values	Chapter 3.0, Section 3.10	
RM-PSC-012-2015 1030	Rollie Wilson (Western Shoshone, Te-Moak Tribe, Battle Mountain Band Counsel)	25	Health and safety: BLM should address potential health and safety impacts to the Band and other tribal members, local residents, and workers. Potential health impacts to the Band include impacts from increases in inhaled and ingested contaminants, noise, traffic, toxic chemical and reagent spills, primary and secondary contact with contaminated water, electrical transmission lines, mental anguish, stress, and anxiety associated with the mining project. Local resident issues are almost the same as listed for the Band, except local residents may not have as much of a subsistence diet as the Band and therefore would not be as susceptible to ingested contaminants. Worker issues include health and safety working in and around the mine site and potential disasters over the life of the mine.	Native American Traditional Values	Chapter 3.0, Section 3.6	The Federal Mine Safety and Health Administration (MSHA) and the State of Nevada, Department of Business and Industry, Division of Industrial Relations regulate the mine safety and health standards for people working at a mine. Psychological effects are not discussed in this document because they are not considered to be physical effects on the environment within the scope of NEPA. Psychological effects are

Table 1-2. Public Scoping Comments Received during the Scoping Period

Comment Letter #	Commenter	Paragraph #	Comment	Resource Affected	Section Comment Addressed in the EIS	Additional Notes
						considered to be subjective and speculative for inclusion in NEPA documents. An internet search was conducted to find information regarding psychological effects on the Western Shoshone people in Nevada caused by mining. No information is available. This type of information may not be available because of the privacy rule for health information under the Health Insurance Portability and Accountability Act of 1996 (HIPAA).
RM-PSC-012-2015 1030	Rollie Wilson (Western Shoshone, Te-Moak Tribe, Battle Mountain Band Counsel)	26	Threatened and endangered species: BLM should address potential impacts to federal and state listed plants, animals, and candidate threatened and endangered species.	Special Status Species	Chapter 3.0, Section 3.18	
RM-PSC-012-2015 1030	Rollie Wilson (Western Shoshone, Te-Moak Tribe, Battle Mountain Band Counsel)	27	Vegetation: BLM should address potential impacts to forests, traditional medicinal plants, exotic species, and vegetation impacted by power, roads and other corridors.	Vegetation, Including Riparian Zones and Wetlands; Noxious Weeds and Non-native Invasive Plant Species	Chapter 3.0, Sections 3.14 and 3.15	
RM-PSC-012-2015 1030	Rollie Wilson (Western Shoshone, Te-Moak Tribe, Battle Mountain Band Counsel)	28	Environmental justice: BLM should address the potential for the mine to cause disproportionate risk to the Band and other tribes in terms of demographic, geographic, economic, and human health and risk factors, cultural and ethnic differences, and historic and policy issues	Environmental Justice	Chapter 3.0, Section 3.21	

Table 1-2. Public Scoping Comments Received during the Scoping Period

Comment Letter #	Commenter	Paragraph #	Comment	Resource Affected	Section Comment Addressed in the EIS	Additional Notes
RM-PSC-012-2015 1030	Rollie Wilson (Western Shoshone, Te-Moak Tribe, Battle Mountain Band Counsel)	29	Cumulative impacts: BLM should address potential cumulative impacts due to mining, ore processing and/or stockpiling, the Band and other tribes, and water resources. Mining issues include cumulative impacts of the Project on mining across northern Nevada, increased exploration, supporting industries, and existing, planned and foreseeable mining activities. Ore processing issues include using mine facilities for processing ore from other future mines. Issues related to the Band and other tribes should be focused on cumulative environmental impacts in the area reserved by the Band in the Treaty of Ruby Valley. Water issues include potential cumulative impacts from dewatering springs utilized by the Band, wildlife and plants, water quality from discharges of treated mine wastewater and cumulative impacts from interrelated water projects in northern Nevada.	Multiple Resources	Chapter 3.0	
RM-PSC-012-2015 1030	Rollie Wilson (Western Shoshone, Te-Moak Tribe, Battle Mountain Band Counsel)	30	Ecosystems: BLM should address potential physical, chemical and biological impacts related to the rivers, air, plants, wildlife and the total ecosystem. Ecosystem issues include impacts on the Antelope Creek and Humboldt River ecosystems, tribal resources, natural resources and the total ecosystem.	Multiple Resources	Chapter 3.0	
RM-PSC-012-2015 1030	Rollie Wilson (Western Shoshone, Te-Moak Tribe, Battle Mountain Band Counsel)	31	Wildlife: BLM should address potential impacts to wildlife, including habitat, migratory and birds, mammals, insects, and amphibians, especially as the Band and other tribes rely on these resources for cultural, religious and subsistence purposes. Habitat issues include direct and indirect impacts on wildlife habitat from the Project, lowered and erratic stream flows, and short-term demand for roads, houses, shops, schools, and other services. Bird issues include impacts from feeding on contaminated fish, ingesting water and spreading contaminants, transmission lines, air traffic, noise, mercury, wetland loss effects on nesting, mining activities on migratory birds, and air quality impacts on birds of prey, waterfowl and their migration patterns,	Multiple Resources	Chapter 3.0	In 1968 CEQ revoked the requirement to analyze worst case scenarios under NEPA. The CEQ regulation 40 CFR 1500.1 directs that NEPA documents must concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail. It also states that analyses must "focus on significant environmental issues and alternatives".

Table 1-2. Public Scoping Comments Received during the Scoping Period

Comment Letter #	Commenter	Paragraph #	Comment	Resource Affected	Section Comment Addressed in the EIS	Additional Notes
			songbirds, and other birds. Mammal issues include impacts from noise, feeding on contaminated fish, mercury, transmission lines, and impacts on, for example, deer herds and their migration patterns, antelope, porcupine, bobcat, fishes, and their habitat. Insect issues include air quality impacts on bees, dragonflies, and other insects, and impacts on pollination. Amphibian issues include air quality impacts on turtles, frogs, and other amphibians.			
RM-PSC-012-2015 1030	Rollie Wilson (Western Shoshone, Te-Moak Tribe, Battle Mountain Band Counsel)	32	Recreation: BLM should address potential impacts to recreational use of resources including issues related to tourism, recreational water uses, fishing recreation, and expansion of highway use.	Recreation and Wilderness	Chapter 3.0, Section 3.11	
RM-PSC-012-2015 1030	Rollie Wilson (Western Shoshone, Te-Moak Tribe, Battle Mountain Band Counsel)	33	The Band appreciates BLM's consideration of these comments and looks forward to consulting with the BLM on an outline or draft scoping document. As discussed in and intended by the Executive Order on Consultation and Interior's Consultation Policy, "Consultation is a deliberative process that aims to create effective collaboration and informed Federal decision-making." Interior Consultation Policy at 2. Thus, through meaningful government-to-government consultation, BLM can improve its fulfillment of NEPA and NHPA, and create a more effective permitting process. Please contact the Band's Counsel, Rollie Wilson, to schedule further consultation on the proposed Project.			
RM-PSC-013-2015 0912	Jean Public	1	I oppose all expansion of waste rock facilities.			
RM-PSC-013-2015 0912	Jean Public	1	Put me on the mailing list.			
RM-PSC-013-2015 0912	Jean Public	1	You have destroyed almost a thousand acres already and you want to destroy more? No way. I am against all expansion of the boundary area. I oppose all expansion of open pits. I oppose all new open pits. I oppose expansion of waste rock facilities. I oppose all new waste			

Table 1-2. **Public Scoping Comments Received during the Scoping Period**

Comment Letter #	Commenter	Paragraph #	Comment	Resource Affected	Section Comment Addressed in the EIS	Additional Notes
			rock facilities I oppose all new roads and haul roads. I oppose all tail ponds or expansion of tail ponds. No more expansion on national property should be allowed. Enough is enough.			
RM-PSC-013-2015 0912	Jean Public	1	This destruction of 1,000 acres with this poison is enough to be destroyed. No wildlife can live in this desolate poisoned area. They are destroyed forever. The wildlife has been slaughtered. BLM does a lousy job of protecting our national land. tbm [sic] seems to allow profiteers to destroy endlessly. We need to hire new people at BLM who can do the job of protecting nature from developers. We certainly do not have on staff those kinds of people at the present time and our national land is being destroyed and the nation gets zero out of it. This comment is for the public record please receipt.	Wildlife and Aquatic Biological Resources	Chapter 3.0, Section 3.17	
RM-PSC-014-2015 1019	Nevada State Land Use Planning Agency	1	Please consider the cumulative visual impacts from development activities (temporary and permanent), including proliferation of improper lighting. The following mitigation measures should be required: Utilize appropriate lighting. Utilize consistent lighting mitigation measures that follow "Dark Sky" lighting practices. Effective lighting should have screens that do not allow the bulb to shine up or out. All proposed lighting shall be located to avoid light pollution onto any adjacent lands as viewed from a distance. All lighting fixtures shall be hooded and shielded, face downward, located within soffits and directed on to the pertinent site only, and away from adjacent parcels or areas. A lighting plan should be submitted indicating the types of lighting and fixtures, the locations of fixtures, lumens of lighting, and the areas illuminated by the lighting plan. Any required FAA lighting should be consolidated and minimized wherever possible.	Visual Resources	Chapter 3.0, Section 3.12	
RM-PSC-014-2015 1019	Nevada State Land Use Planning Agency	2	In addition, the following mitigation measures should be employed: 1) Utilize building materials, colors and site placement that are compatible with the natural environment. Utilize consistent mitigation measures that	Visual Resources, Land Use and Access	Chapter 3.0, Sections 3.12 and 3.19	

Table 1-2. Public Scoping Comments Received during the Scoping Period

Comment Letter #	Commenter	Paragraph #	Comment	Resource Affected	Section Comment Addressed in the EIS	Additional Notes
			address logical placement of improvements and use of appropriate screening and structure colors. Existing utility corridors, roads and areas of disturbed land should be utilized wherever possible. Proliferation of new roads should be avoided. For example, the use of compatible paint colors on structures reduces the visual impacts of the built environment. Using screening, careful site placement, and cognitive use of earth-tone colors/materials that match the environment improve the user experience for others who might have different values than what is fostered by built environment activities. Federal agencies should require these mitigation measures as conditions of approval for all permanent and temporary applications.			

X[1] The amount of the financial guarantee or a long-term trust is not subject to NEPA analysis, but is part of the enforcement program for the 43 CFR 3809 regulations. The operating and reclamation plans determine potential impacts and constitute mitigation, not the reclamation financial guarantee amount.

X[2] Government-to-government consultation is not a NEPA process. Government-to-government consultation is a separate process from NEPA. However, government-to-government consultation may be initiated and conducted concurrently with the NEPA process.

1.9 Organization of the Environmental Impact Statement

This EIS follows the CEQ recommended organization (40 CFR 1502.10). Chapter 1.0 provides descriptions of the purpose and need for the action, the role of the BLM in the EIS process, and the required regulatory actions for the proposed project. Chapter 2.0 describes the Proposed Action and alternatives, including the No Action Alternative. Chapter 3.0 describes the affected environment and the direct, indirect, and cumulative impacts associated with the Proposed Action and alternatives; possible mitigation to reduce or minimize impacts; and any residual adverse effects following the implementation of mitigation. Chapter 4.0 summarizes public participation and the scoping process and the consultation and coordination undertaken to prepare the EIS. Chapter 5.0 presents the list of EIS preparers and reviewers. Chapter 6.0 presents the list of references. Copies of supporting documents are on file at the BLM Tuscarora Field Office in Elko, Nevada.

2.0 Description of the Alternatives Including the Proposed Action

2.1 Introduction

This Chapter describes the Proposed Action/project as described by HES in their PoO and Reclamation Permit Application, BLM file NVN-070547 (SRK 2014a). Chapter 2.0 also presents the No Action Alternative and other alternatives that are analyzed in this EIS, as well as other alternatives that were considered but eliminated from detailed analysis.

2.1.1 Project Background

The proposed project is located in the Bootstrap Mining District within the Carlin Trend in Northeastern Nevada. Exploration and mining activities have occurred in the Bootstrap Mining District over the past several decades to locate and extract multiple types of metals and minerals including gold, barite, silver, antimony, and mercury (Tingley 1998).

Antonio Rossi and Carlo Cereghino discovered several barite outcrops in April 1937 while prospecting in the Bootstrap Mining District and the present-day Rossi Mine vicinity. Following World War II, Baroid Drilling Fluids, Inc. (Baroid), a division of National Lead Company (now NL Industries), conducted additional exploration throughout the district and began design work for the Rossi Mine and a bulk load-out facility to be located at Dunphy Siding. The mining of direct-ship barite ore from several high-grade ore bodies (averaging 95% barite) began in 1947; however, by the late-1950's, these barite deposits approached depletion. In order to supplement high-grade barite ore production with the larger low-grade barite ore deposits present at the mine, Baroid constructed a gravity separation/concentration facility (jig plant) at the Rossi Mine site and a grinding and packaging facility at Dunphy Siding (the Dunphy Mill Facility) (NDEP 2016a).

NL Industries sold their Baroid subsidiary in 1993 to Dresser Industries (Dresser). HES, a leading supplier of drilling equipment and fluids, acquired Dresser in 1998, and kept Baroid as a separate subsidiary. HES is the current operator of the Rossi Mine. Barite (barium sulfate or $BaSO_4$) is used extensively as a weighting agent in drilling muds in part due to its high specific gravity (4.5).

HES and its predecessors have actively mined barite from the Rossi Mine using open pit methods since 1947. Mining operations are conducted on private (patented) and unpatented mining claims controlled by Barrick and leased to HES. The unpatented claims are located on public lands managed by the BLM Tuscarora Field Office. **Table 2-1** provides a summary of previous NEPA analyses and other related permitting documents and authorizations associated with the Rossi Mine.

Table 2-1. Summary of NEPA Analyses and Permitting Documents for the Rossi Mine

Plan/Permit/ NEPA Document No.	Date	Original Entity	Description	Status/ Notes
NVN-042788 NVN-0064825 NVN-0064826	--	NL Industries	Barite Mineral Patent Application (Lode)	Completed
NVN-070547	1981	HES	Surface Management Plan of Operations	Authorized
EA-NV-010-81-028	1981	HES	Environmental Assessment	Completed
EA-NV-010-93-010	1993	HES	Environmental Assessment	Completed
BLM/EK/PL-98/002	1998	HES	Environmental Assessment	Completed
DOI-BLM-NV-N020-2010-0008-EA	2010	HES	Environmental Assessment	Completed

Sources: SRK 2014a; BLM 2016a.

2.2 Existing Rossi Mine Operations

Existing mining and processing operations at the Rossi Mine are conducted under the terms of current permits and approvals as authorized by the BLM and the State of Nevada (**Table 1-1** and **Table 2-1**).

2.2.1 Surface Ownership

The current Rossi Mine PoO area includes approximately 1,919 acres. **Table 2-2** provides a summary of land ownership status within the authorized PoO area.

Table 2-2. Land Status

Ownership Status	Township, Range, and Sections	Total Study Area Acreage
Existing/Authorized – Rossi Mine		
Public – BLM Elko District Office	T37N, R49E sections 14-16, 21-23, 27 and 28	1,700
Private – Barrick Gold Exploration Inc.	T37N, R49E sections 14, 15, 21, 22, 27 and 28	215
Private – 25 Ranch LLC	T37N, R49E section 16	4
Total		**1,919**

Source: BLM 2010a.

2.2.2 Work Force

Employment and work force at the Rossi Mine fluctuates based on market demand for processed barite. HES employs between 24 and 60 staff at the jig plant. The mining and excavation contractor employs an additional 60 to 300 employees. HES and subcontractor staff commute from Battle Mountain, Elko, Carlin, and Spring Creek communities via U.S. Interstate Highway 80 (I-80). Parking for the HES jig plant employees and mine contractor employees is provided in a private lot at the HES Dunphy Mill site. Employees are then transported to the Rossi Mine site in busses, vans, or light trucks.

2.2.3 Current Mining Disturbance

Surface disturbance within the current Rossi Mine operations area includes approximately 908 acres, of which approximately 707 acres are BLM administered public lands and 201 acres of patented mining claims maintained by Barrick, as shown in **Figure 1-2**. A summary of acres of currently authorized surface disturbance by facility area is listed in **Table 2-3**.

Table 2-3. Currently Authorized Surface Disturbance

Facility	Private (acres)[1]	Public (acres)[1]	Total[1]
Pits			
King Pit	166	81	247
Queen Pit	21	0	21
QLEE Pit	0	40	40
Pit Subtotal	**187**	**121**	**308**
Waste Rock Disposal Facilities (WRDF)			
King North WRDF	0	286	286
King South WRDF	6	107	113
Queen West WRDF	6	5	11
Queen Lode WRDF	2	51	53
WRDF Subtotal	**14**	**449**	**463**
Roads			
Haul Roads	0	9	9
Secondary Roads	0	6	6
Roads Subtotal	**0**	**15**	**15**
Exploration Activities			
Exploration Roads and Pads	0	70	70
Monitoring Wells	0	2	2
Exploration Subtotal	**0**	**72**	**72**
Operations			
Ponds	0	6	6
Jig Plant/Processing Area	0	42	42
Fire Break	0	2	2
Operations Subtotal	**0**	**50**	**50**
Total	**201**	**707**	**908**

Source: SRK 2014a.

[1] Acreages have been rounded to the nearest whole number, totals may vary due to rounding.

2.2.4 Existing Facilities

2.2.4.1 Open Pits

Three open pits are currently authorized for mining operations within the PoO boundary: the King Pit, Queen Lode Pit, and Queen Lode Eastern Extension Pit (QLEE). HES is currently authorized to partially backfill portions of the existing King Pit. Ore mined from the three pits is blended together during processing to meet industry standards for barite. **Figure 2-1** provides locations of existing facilities within the authorized Rossi Mine PoO boundary. **Table 2-4** presents the approximate dimensions of previously authorized open pits. None of the previously authorized open pits are anticipated to encounter current groundwater tables as discussed in Section 3.4, Water Resources and Geochemistry. The local groundwater table has declined in elevation in recent years due to dewatering operations at the adjacent

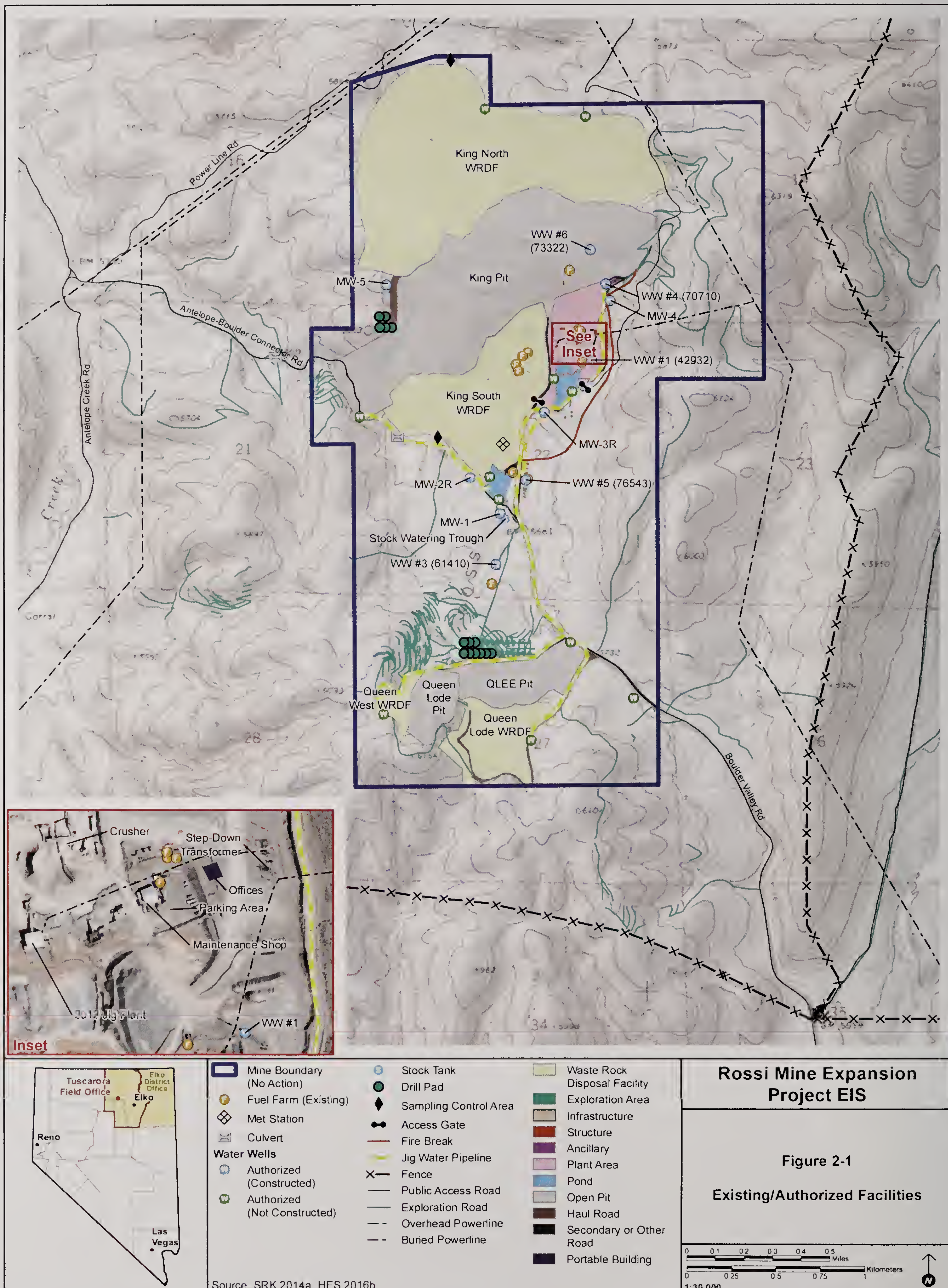
Barrick Goldstrike Mines Inc. (BGMI) Betze Pit which began in 1991. Pre-1991 groundwater elevation data is limited although historic data indicates the groundwater elevation on the western flank of the Tuscarora Mountains ranged from approximately 5,700 feet above mean sea level (amsl) near the mountains to approximately 4,600 feet amsl in the lower portions of Boulder Valley. Groundwater modeling from this data indicates that pre-1991 groundwater elevations for the Rossi Mine area may have been between approximately 5,250 feet amsl and 5,500 feet amsl (BLM 2008a). Under previous authorizations, the King Pit could intersect the pre-1991 groundwater table with a final pit depth of 5,470 feet amsl.

Table 2-4. Previously Authorized Open Pit Design Parameters

Pit	Width (feet)	Length (feet)	Depth (feet bgs[1])	Pit Bottom Elevation (feet amsl)
King Pit	2,065	6,614	500	5,470
Queen Lode Pit	833	1,375	200	5,800
QLEE Pit	833	2,365	200	5,780

Sources: BLM 2010a, HES 2016b.

[1] below ground surface.



Rossi Mine Expansion Project EIS

Figure 2-1

Existing/Authorized Facilities

10/10/2017

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data.
Original data were compiled from various sources. This information may not meet National Map Accuracy Standards
This product was developed through digital means and may be updated without notice.

Drilling and Blasting Activities

Current authorized operations use conventional drilling and blasting techniques and include the use of diesel-powered blast-hole drill rigs. Rock within the existing/authorized open pit areas is drilled and blasted for excavation using an ammonium nitrate and fuel oil mixture or emulsion. Other appropriate blasting agents are used dependent upon the specific characteristics of the overlying rock. Blasting material and other explosives are stored, handled, and used according to Mine Safety and Health Administration (MSHA) and ATF regulations in addition to other federal, state, and local statutes and regulations. As a safety precaution, blasting material and explosives are stored in appropriate magazines, for which the exact locations are not provided to the public in accordance with homeland security requirements. Under existing authorizations, blasts occur approximately once per day but can vary with the level of mining operations. The total amount of explosives or blasting material used varies depending on the size of the working face of the pit wall under excavation. Drilling and blasting operations are conducted by a mining contractor.

Ore Handling and Stockpiling

Blasted ore is moved from the pit using front-end loaders and haul trucks. Haul trucks having carrying capacities of approximately 100 tons are used to transport the ore out of the pit. Ore is transported to multiple designated stockpiles within the processing area prior to crushing and processing. Stockpiles within the processing area include crusher feed stockpiles, jig feed stockpiles, jig product stockpiles, jig tails stockpiles, and direct ship ore stockpiles.

2.2.4.2 Waste Rock Disposal Facilities

Four WRDFs are authorized for construction within the PoO boundary: the King North, King South, Queen West, and the Queen Lode. The Queen Lode Pit is also authorized to be backfilled. Blasted waste rock is moved from the pit using front-end loaders, excavators, and haul trucks. Haul trucks having carrying capacities of approximately 100 tons are used to transport waste rock out of the pit. Waste rock material is transported directly to a WRDF after blasting. These WRDFs are constructed at the angle of repose during active mining operations and would be graded down to a 2.5 Horizontal (H): 1 Vertical (V) slope during final reclamation. A summary of previously authorized WRDF design parameters is presented in **Table 2-5**.

Table 2-5. Previously Authorized WRDF Design Parameters

Waste Rock Disposal Facility	Width (feet)	Length (feet)	Capacity (MT)[1]	Crest Height (feet)	Crest Elevation (feet amsl)
King North	3,265	5,881	113.2	380	6,200
King South	1,904	3,108	36.2	235	5,860
Queen Lode	1,395	1,559	3.4	235	6,040
Queen West	734	921	1.5	115	6,120

Sources: SRK 2014a; HES 2017a.

[1] Million Tons.

2.2.5 Ore Processing

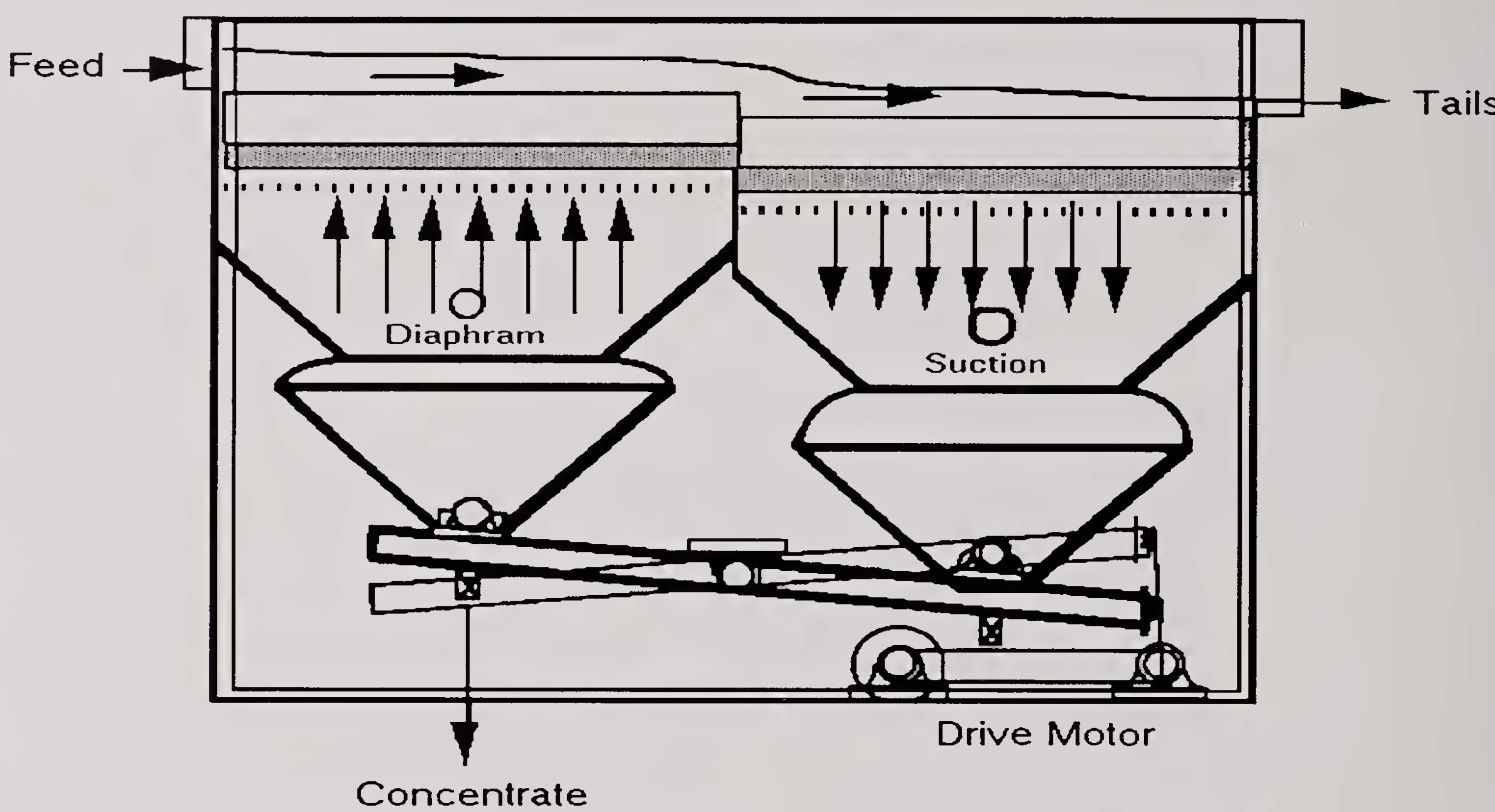
2.2.5.1 Ore Crushing

Crushing and stockpiling operations are conducted by a mining contractor. Stockpiled ore is loaded into the rock crushing unit prior to processing through the jig plant. The ore crushing unit is located adjacent to the jig plant facility as shown in **Figure 2-1**.

2.2.5.2 Jig Plant Processing

Crushed ore is then either processed through the jig plant located in the processing area (**Figure 2-1**) or stockpiled for direct shipping to the Dunphy Mill for milling, packaging, and shipping. The jigging process is a wet process that separates barite from waste material (jig tailings) using only water and gravity. Barite product flows through the jig system which separates jig tails from the product via gravity separation. A schematic of the process flow and water circuits used in the jigging system is displayed in **Figure 2-2**. Once separated from the jig tails, produced barite is collected in a product bin and moved to a production stockpile using a front-end loader. Jig tails produced in the separating process are routed to jig tail stockpiles within the processing area for use as road base material or alternatively deposited in an on-site WRDF.

Figure 2-2. Jigging Process Flow Schematic



Source: HES 2015b.

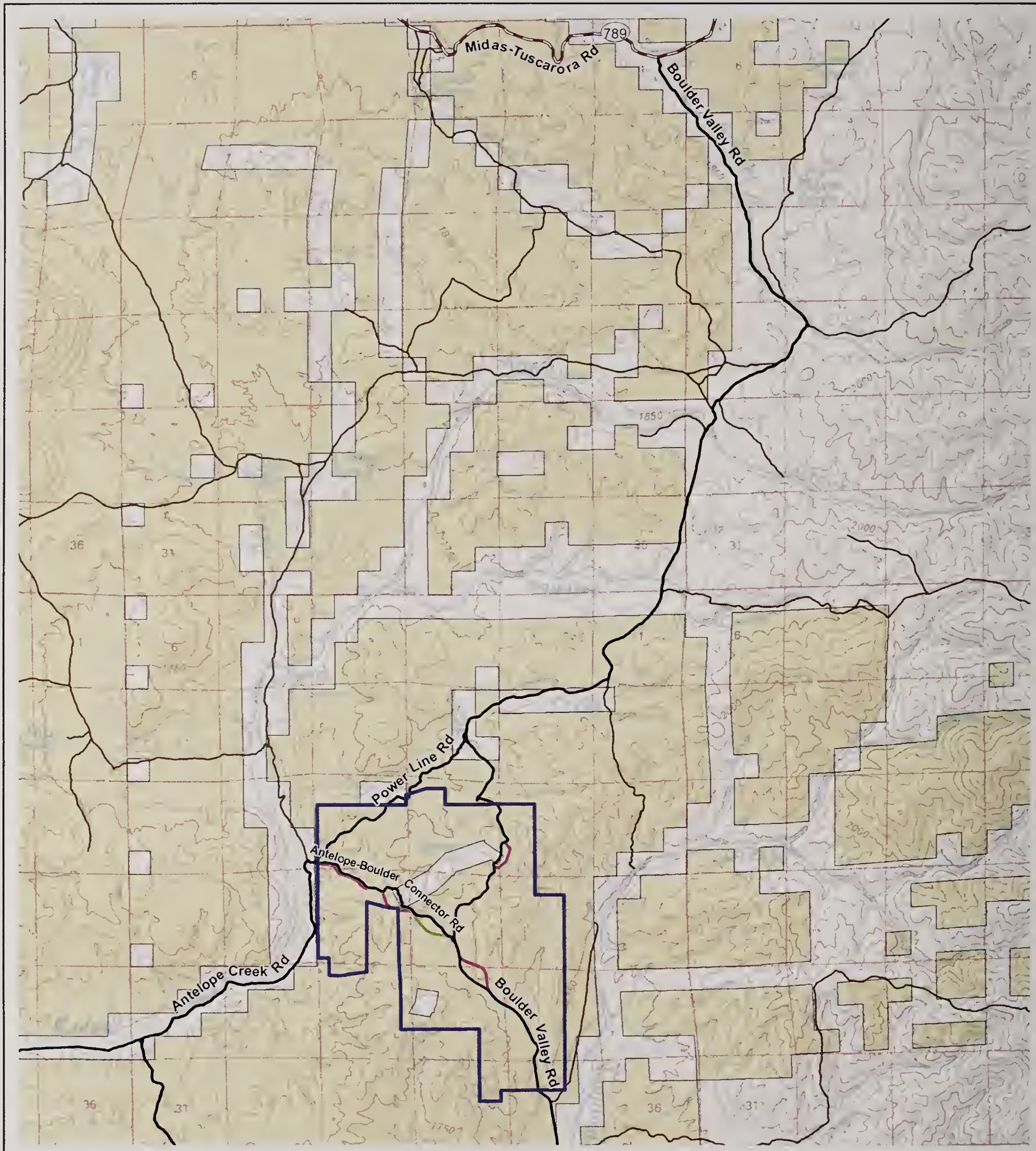
2.2.6 Haul, Secondary, and Public Access Roads

2.2.6.1 Haul and Secondary Roads

The existing haul roads for the King Pit area are located within the existing or authorized pit and WRDF disturbance footprints. The Queen area haul road runs from the north edge of the Queen Lode Pit to the Boulder Valley Road. Running surfaces of the haul roads vary between 40 and 80 feet in width and are constructed with appropriate safety berms in accordance with MSHA regulations. Authorized exploration roads and secondary roads that provide access to ponds and wells are located throughout the project area and commonly have running widths varying from ten to thirty feet (**Figure 2-1**). Haul and secondary roads within the active mining area follow a left-hand traffic pattern. Signs directing traffic to the left-hand traffic pattern are located on the Boulder Valley Road south of the existing QLEE Pit area. Haul road and secondary road maintenance is conducted by HES on an as needed basis and varies dependent upon weather and seasonal traffic patterns. Maintenance actions could include snow removal, blading/grading, rut repair, and culvert repair. The application of magnesium chloride has been implemented by HES in the past in limited instances along the roads when extremely dry and dusty conditions occur. Otherwise magnesium chloride is not typically used by HES during haul and secondary road maintenance under existing authorizations.

2.2.6.2 Access Roads

The project area is accessed from the south via the Boulder Valley Road, a public access road as shown in **Figure 2-3**. The Boulder Valley Road by-passes the east side of the jig plant processing area and connects the Midas-Tuscarora Road (County Road 724) to the north of the project area. A third public access road, the Antelope-Boulder Connector Road (BLM Road 1227), connects to the Boulder Valley Road south of the stock pond to the Antelope Creek Road (**Figure 2-3**). These public access roads vary in running width from 20 to 60 feet. Access roads follow a right-hand traffic pattern common on most county roads. Traffic within the active mining area changes to a left-hand pattern. Signs directing traffic to the left-hand traffic pattern are located on the Boulder Valley Road south of the existing QLEE Pit area. HES, on a year-round basis, has voluntarily maintained two separate portions of the Boulder Valley Road; from the Dunphy Mill to the Rossi Mine boundary and immediately north of the project area near the Coyote Substation. Access road maintenance is the same as described in Section 2.2.6.1, Haul and Secondary Roads.



Mine Boundary (Proposed)

Land Status

Bureau of Land Management

Private

Public Access Routes

State Highway

Existing/Authorized

Proposed Realignments

Alternate Realignments

Other Road

Source: SRK 2014a, BLM 2015g.

Rossi Mine Expansion Project EIS

Figure 2-3

Public Access Routes within the Project Vicinity
(Township 37 North, Range 49 East)

0 0.5 1 1.5 2 Miles

0 0.5 1 1.5 2 Kilometers

1:100,000

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2.2.7 Ancillary and Support Facilities

2.2.7.1 Building and Structures

Existing buildings and structures within the Rossi Mine managed by HES include one maintenance building, one triple-wide portable building serving as the security check in office and work space for mine staff (office), one double-wide portable building serving as the staff lunch/change room, multiple connex storage boxes, and multiple equipment trailers. Contractor facilities not owned or maintained by HES include two portable office trailers, multiple connex storage boxes, a maintenance canopy, and two tank containments. The two office trailers are located to the south of the King Pit area. The remaining contractor equipment and facilities are located at the ready line area within the King South WRDF.

2.2.7.2 Power Supply

For this EIS, transmission lines are defined as power lines designed and constructed to support voltages greater than 60-kilovolts (kV), while distribution lines are defined as power lines designed and constructed to support voltages between 2.4-kV and 60-kV.

Power to the jig plant facility and other supporting facilities within the processing area is provided from the NV Energy secondary step-down transformer located on the east side of the processing area (**Figure 2-1**). Electric power is reduced from the 120-kV NV Energy transmission line to the existing 24.9-kV overhead distribution lines at the step-down transformer. From there, 24.9-kV overhead distribution lines supply power to the jig plant processing area, ore crushing area, and other support buildings located within the processing area. Energy supplied to the mining contractor's maintenance area and water well pumps is produced from portable diesel generators adjacent to these features within the mine site (**Figure 2-1**).

2.2.7.3 Lighting

Operational lighting is used at the jig plant processing area and in the open pits. HES is currently authorized to conduct mining and processing operation 24 hours a day, seven days a week at the Rossi Mine. Permanent lighting fixtures are installed at the jig plant, ore crusher, office building, parking area, fueling area, and maintenance building. These permanent fixtures are mounted on the building exteriors or on masts. All fixtures are positioned to shine light downward and include either light shields or screens in an effort to minimize light pollution. Lighting is only used when necessary for operational and mining staff safety and is directed to avoid light pollution onto any adjacent lands when viewed from a distance. HES maintains a Rossi Mine Lighting Management Plan for existing operations that require permanent and temporary lighting. The Rossi Mine Lighting Management Plan is available as an appendix to the PoO on file with the BLM.

Operations within the active pit areas, ready lines, and WRDFs may use mobile, diesel-powered light plants at night to allow HES to conduct mining operations safely and efficiently and to comply with MSHA illumination requirements. Areas would be temporarily lit using light plants only when active mining or exploration is taking place. Light plants would be powered by internal six kilowatt diesel powered generators.

2.2.7.4 Fuel

Fuels and hydrocarbons used during operations in the maintenance area, ready line, crusher, and jig plant are stored in a storage area (also known as a "fuel farm") (**Figure 2-1**) located within secondary containment consisting of either double-walled tanks or high-density polyethylene (HDPE) lined containment. The existing fuel farm is located approximately 120 feet to the northwest of the office building. A list of fuels and hydrocarbons, storage quantities, and general usage rates is provided in **Table 2-6**.

Table 2-6. Fuels, Solid Waste, and Hazardous Materials Storage and Usage Rates

Type of Waste	Estimated Annual Quantity					
	No Action Alternative		Proposed Action		Reconfiguration Alternative	
	Existing Storage Volume (Gallons)	*Annual Usage (Gallons)*	*Existing Storage Volume (Gallons)*	*Annual Usage (Gallons)*	*Existing Storage Volume (Gallons)*	*Annual Usage (Gallons)*
Fuels						
Diesel fuel	44,783	1,900,000	89,566	3,800,000	89,556	2,936,000
Gasoline	2,175	39,200	2,675	47,040	2,675	47,040
Kerosene	496	50	496	50	496	50
Propane	5	10	5	10	5	10
Hazardous Waste						
Aerosol can drainage	55	30	110	60	110	60
Spent solvent	600	300	900	600	900	600
Used paint	50	30	50	30	50	30
Antifreeze	900	500	1200	1000	1200	780
Universal Waste						
Fluorescent bulbs	72 bulbs	48 bulbs	72 bulbs	48 bulbs	72 bulbs	48 bulbs
Vehicle batteries	0 batteries	10 batteries	0 batteries	20 batteries	0 batteries	20 batteries
Oil Products[1]						
Motor oil	7,866	11,650	15,732	23,300	15,732	23,300
Mineral oil[2]	884	NA	1,768	NA	1,768	NA
Assorted oils[3]	2,538	10,030	5,076	20,060	5,076	20,060
Grease	710	16,383	1,420	32,766	1,420	32,766
Solid Non-hazardous Waste						
Other trash/waste	125 cubic yards	350 cubic yards	125 cubic yards	455 cubic yards	125 cubic yards	455 cubic yards

Source: HES 2016a.

[1] No used oil is delivered off site. All used oil is consumed in an oil burner.
[2] Mineral oil stored at electric transformer location. No annual usage rate.
[3] Includes gear oil, hydraulic fluids, and transmission fluids.

2.2.7.5 Sanitary and Solid Waste Disposal

HES collects all solid waste generated within the Rossi Mine site in approved containers located at the jig plant, maintenance shop, and other work areas. Solid waste containers are then transferred via truck to an approved off-site solid waste disposal landfill. Petroleum-contaminated soils (PCS) resulting from spills or leaks of hydrocarbons are removed from the spill site and placed in a dedicated container and transported off-site to an approved facility in accordance with federal, state, and local regulations. Multiple solid waste containers are located within the processing area during operations. An underground holding tank receives domestic sanitary waste from the security administration office and lunch/change room portable buildings (permitted under NDEP Discharge Permit NS2015508). This tank is pumped regularly and disposed offsite as permitted.

2.2.7.6 Site Security, Signs, and Fencing

Signs posted at mine entrances direct visitors to the office located approximately 320 feet to the east of the jig plant. This building consists of a single one-story building approximately 50 feet wide by 45 feet long and serves as the office where visitors and deliveries are checked in and out of the mine site. The office also provides site specific MSHA required safety trainings and access to first-aid supplies and mining operations communication equipment.

HES or the mining subcontractor may erect temporary fencing on an as-needed basis for public safety, livestock exclusion, or other regulatory requirements. Fencing may include livestock panels, three-strand wire fence, or orange barrier fence depending on the intended application. Although, several areas of visible signage are posted throughout the mine site to inform mine visitors and the public of potential hazards and areas of active mining, no physical barriers or gates are currently installed to block public access to the mine site. In order to manage public access to areas where active ore crushing and processing occur and to minimize access to processing equipment during periods of temporary inactivity, HES maintains two locking gates located to the south of the jig plant processing area (**Figure 2-1**). These gates are located on land managed by the BLM and do not preclude public access to areas typically used for recreational or other public uses.

2.2.7.7 Hazardous Materials and Hazardous Waste Management

All fuels and hydrocarbons used during mining and processing operations are stored in areas protected by secondary containment measures that include double-walled tanks or HDPE-lined containment. A list of fuels and hydrocarbons used during mining and processing operations, storage quantities, and usage rates is provided in **Table 2-6**. Used oils and solvents are stored and characterized according to requirements of the Resource Conservation and Recovery Act (RCRA). Used oil and coolant fluid are stored at the maintenance shop under appropriate secondary containment. The used coolant and oil are not mixed and are either recycled or disposed of in accordance with state, federal, and local regulations. Used containers are also disposed of or recycled according to federal, state, and local regulations.

The existing jig plant facility uses only water and gravity to process barite ore. HES does not use chemicals to process barite ore, therefore there are no chemical sumps, specialized containments, or heap leach pads required. The jig plant ponds are not lined for containment but are sampled quarterly for water quality compliance under NDEP Water Pollution Control Permit NEV #2015112.

HES maintains a waste management plan that identifies waste generated at the mine site and their appropriate means of disposal. Mine staff are trained in proper handling, storage, and emergency procedures relevant to their responsibilities; contractors transporting and disposing of these materials are certified by the Nevada Department of Transportation (NDOT) and the NDEP-BMRR.

Blasting material and other hazardous explosives are stored, handled, and used according to MSHA and ATF regulations in addition to other federal, state, and local statutes and regulations.

2.2.7.8 Safety and Fire Protection

Existing mining and processing operations are conducted in conformance with MSHA safety regulations [30 CFR 1-199] and applicable federal and state fire laws and regulations. HES has undertaken measures to prevent and suppress fires in the area of operations including installation and maintenance of a firebreak located around the periphery of the jig plant processing area. Other fire protection equipment includes a requirement for HES and on-site contractor vehicles to carry fire extinguishers, hand tools, and/or backpack type water pumps to suppress small fires in accordance with MSHA and other federal, state, and local regulations.

2.2.7.9 Water Supply, Demand, and Management

HES has installed five water production wells (water wells [WW]), five monitoring wells (MW), and one below ground storage tank as shown in **Figure 2-1**. The below ground storage tank provides potable water to the mine office. Current well yield in 2015 was 43 gallons per minute (gpm) for operating production wells. If needed, additional water monitoring wells have been authorized under the existing NDEP-BMRR water pollution control permit. Production well depth ranges from approximately 400 to 2,000 feet below ground surface. Existing production wells currently produce an insufficient volume of water to support the jigging and dust control operations. To meet water use demand under current operations, water is trucked in from the nearby Barrick Goldstrike Mine dewatering wells. **Table 2-7** provides a summary of water supply sources and quantities generated. Under existing authorizations, HES may implement the following: convert three monitoring wells to production wells, drill and install nine additional monitoring and/or production wells, and construct an underground pipeline to connect production wells to the jig plant.

Three existing unlined ponds are located to the south of the jig plant processing area: the upper pond, the lower pond, and the stock pond. The upper and lower ponds collect fine material produced from the jig plant and recirculate jig plant process water. The stock pond provides water storage and makeup water to support normal operations. Both the upper and lower ponds are periodically excavated to remove accumulated fines. The recovered fines are incorporated in with salvaged growth media for use in on-site reclamation activities. Water circulation between the three ponds and jig plant is accomplished using a mix of mobile pumps, generators, and temporary pipelines.

Upgrades to the existing Rossi Mine water system have been previously authorized under NDEP Water Pollution Control Permit NEV #2015112 but have yet to be installed. The proposed improvements consist of modifications to the existing jig plant that would improve the overall barite jig processing efficiency, recover fine tails with the use of a flocculent, eliminate the need for the existing lower processing pond, reduce the amount of water used in jig processing from approximately 80 gpm down to 39.5 gpm, and electrify the existing production well and pond pumps used for processing make-up water, eliminating the need for portable diesel generators. The water conservation system upgrades consist of concrete channels and weirs designed for the capture and removal of accumulated fines sediments resulting from processing operations. The water conservation system would also be alternatively upgraded through the installation of a thickening tank and associated pumps, pipelines, and channels. Under previous authorizations existing pipelines, channels, and other infrastructure would continue to be used where possible. In addition, the use of flocculants could be implemented to increase sedimentation rates of jig plant produced fines. The flocculants delivery system would include a holding tank and metering pump to deliver an NDEP-BMRR approved flocculent.

A maximum of 3,500 gpm of water is currently required for ore processing at the jig plant. The current water demand for ore processing would be substantially reduced when the previously approved water conservation system is implemented. The water conservation system includes jig plant modifications that would recycle water in a closed-loop type system. Water also is required for dust control at the mine site and for drilling operations. Potable water is delivered to the mine site by truck and is stored in an underground tank near the office building. **Table 2-7** provides a summary of the water demand for existing/authorized operations.

Table 2-7. Water Supply and Demand

Water Supply		
Water Source	***Water Supply (gpm)***	***Water Supply (Million Gallons Per Year)***
Production Wells	43	22.60
Water Trucked from the Goldstrike Mine	192.5	101.18
Total Water Supply	235.5	123.78
Water Demand		
Water Use	***Water Demand (gpm)***	***Water Demand (Million Gallons Per Year)***
Jig Plant with Water Conservation System	39.5	20.76
Other Uses[1]	195	102.49
Total Water Demand	234.5	123.25

Source: HES 2015c.

[1] Includes 156 gpm for dust suppression and drilling operations, 30 gpm for average evaporation loss, and 9 gpm for miscellaneous loss (e.g., infiltration and wet product).

Water quality at the Rossi Mine is actively monitored for compliance with the Water Pollution Control Permit (WPCP) and HES maintains a Water Quality Monitoring Program for quality assurance that has been submitted to NDEP-BMRR and BLM as part of the annual Rossi Mine WPCP Report. Water quality sampling is conducted quarterly by a contractor or qualified HES personnel under the program document. Samples are shipped to and analyzed by a State of Nevada certified laboratory. Quarterly and annual reports are generated by HES to document water quality conditions as under the terms of the WPCP.

2.2.7.10 Stormwater Management

Existing stormwater management features at the Rossi Mine include channels, sediment basins, check dams, and culverts designed to handle 100-year, 24-hour storm events. HES maintains a Stormwater Pollution Prevention Plan (SWPPP) developed in accordance with requirements of the NDEP Stormwater General Permit NVR0500000.

2.2.7.11 Other Ancillary Support Facilities

Other authorized support facilities within the operations area include:

- one generator powered ready line where various mining equipment are staged during mining operations;
- multiple HDPE-lined wash and maintenance pads used for equipment maintenance;
- multiple laydown yards used for equipment maintenance and material storage;
- one truck scale used to scale ore haul trucks;
- one meteorological station;
- multiple portable toilets.

2.2.8 Exploration

HES is currently authorized to conduct temporary surface disturbance for exploration activities within the project area. Exploration activities include construction of roads and drilling pads, surface sampling, trenching, bulk sampling, geotechnical investigation, geophysical survey, water well installation, and drilling using both reverse circulation and core drill rigs.

Exploration drill pads would be approximately 80 feet by 100 feet (approximately 0.18 acre), and roads would have a 14-foot running width with MSHA-compliant berms. Multiple sumps could be excavated on or off the pad with a maximum size of 40 by 50 feet. Proposed sumps would be constructed with one end sloped to provide egress for wildlife. Sumps would be backfilled as soon as practicable.

2.2.9 Growth Media Stockpiles

HES maintains multiple growth media stockpiles within the mine boundary under current authorizations. Suitable growth media (primarily topsoil and Carlin Formation materials) are salvaged during open pit mining operations and retained for subsequent use in reclamation. Growth media is placed in stockpiles within the authorized disturbance area but located such that mining operations would not disturb them during storage. To minimize wind and water erosion, the stockpiles are recontoured to slopes of 2.5H:1V and seeded with an interim seed mix.

2.2.10 Reclamation of Existing Facilities

Existing facilities and those constructed under current authorizations would be reclaimed and closed in accordance with the currently approved reclamation plan, current permits, and applicable federal and state closure and reclamation requirements. Reclamation and final closure of the project site are discussed in the 2014 Rossi Mine Reclamation Cost Estimation update. Concurrent reclamation would be completed once a facility or feature is no longer necessary for future operations. Specific reclamation activities under previous authorizations would include but are not limited to:

- The King and Queen Lode and QLEE pits would be partially backfilled in some areas based upon ore trends determined by exploratory drilling. Areas of open pits not backfilled would be left open due to the steep nature of the pit walls. A six-foot berm would be placed around the pit for safety reasons, and warning signs would be placed approximately every 500 feet.
- WRDFs are designed for regraded reclamation slopes of 2.5H:1V to 3.0H:1V. WRDFs are regraded to blend with the natural terrain and eliminate water catchments upslope of the facility in order to prevent water from ponding above the facility. Diversion structures would be constructed up gradient of the WRDFs to ensure long-term stability as necessary. These diversion structures would be left as post-mining features.
- Ponds would be breached to inhibit the impoundment of runoff and would be scarified and seeded. The ponds have exhibited the ability to support plant growth and so would not be covered by growth media.
- Roads would typically be regraded to their approximate original contour where safe. Berms, ditches, turnouts, and other features would be removed. Water bars and other diversion methods may be either built or retained to enhance stability. Culverts would be removed or buried, and drainage crossings would be reshaped to approximate the original drainage. Riprap or other methods would be used if drainage stabilization is required. Roads that have been compacted would be ripped and then reshaped. If required, growth media would then be placed. Areas along the road where little or no growth media existed prior to mining activities would be recontoured, and the seedbed would be prepared for seeding. Roads which would not be reclaimed are the county road leading to the Coyote Substation and the road to Antelope Creek.
- An approved seed mixture from the BLM approved reclamation plant list would be used for reseeding disturbed areas. Alternative plant species utilized in the reclamation seed mixture may be selected based upon availability and cost. Modifications to the plant list, seed mixture, application rates, and cultivation techniques would be based on concurrent reclamation results, consultation with, and approval by the BLM and NDEP.

2.2.11 Schedule

Reclamation of areas disturbed by mining and operations would commence at the end of active mining operations. A summary of the proposed mining, processing, and reclamation schedule under previous authorizations is provided in **Table 2-8.**

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Table 2-8. Conceptual Schedule of Authorized Mining, Processing, and Reclamation of Authorized Facilities

Activity	Year[1]																				
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Pits																					
King Pit																					
Salvage Growth Media																					
Pit Excavation																					
Post-mining Berm Construction																					
Queen Lode Pit																					
Pit Excavation																					
Post-mining Berm Construction																					
QLEE Pit																					
Pit Excavation																					
Post-mining Berm Construction																					
Waste Rock Disposal Facilities (WRDF)																					
King North WRDF																					
Dump Operation																					
Recontour/Place Growth Media/Seed																					
Monitor Revegetation																					
King South WRDF																					
WRDF Operation																					
Recontour/Place Growth Media/Seed																					
Monitor Revegetation																					
King South WRDF Infill																					
WRDF Operation																					
Recontour/Place Growth Media/Seed																					
Monitor Revegetation																					
Queen Lode WRDF																					
WRDF Operation																					
Recontour/Place Growth Media/Seed																					
Monitor Revegetation																					
Queen Lode Pit Backfill																					
WRDF Operation																					
Recontour/Place Growth Media/Seed																					
Monitor Revegetation																					
Queen West WRDF																					
WRDF Operation																					
Recontour/Place Growth Media/Seed																					
Monitor Revegetation																					

Table 2-8. Conceptual Schedule of Authorized Mining, Processing, and Reclamation of Authorized Facilities

Activity	Year[1]																				
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Jig and Operations Areas Reclamation																					
Building, Facility, and Supplies Demolition/Removal																					
Regrade Yards/Place Growth Media/Seed																					
Monitor Revegetation																					
Reclaim Ponds																					
Evaporate Water and Consolidate																					
Regrade/Place Growth Media/Seed																					
Monitor Revegetation																					
HDPE Lined Facilities																					
Remove Liners and Dispose																					
Sample/Analyze Underlying Soils																					
Regrade Yards/Place Growth Media/Seed																					
Monitor Revegetation																					
Infrastructure																					
Jig Water Return Pipeline																					
Scarify and Seed																					
Monitor Revegetation																					
Electrical Power Service																					
Remove Facilities																					
Regrade/Place Growth Media/Seed																					
Monitor Revegetation																					
Roads																					
Construct Public Access Reroute Road																					
Reclaim Haul Roads																					
Regrade Roads/Place Growth Media/Seed																					
Monitor Revegetation																					
Reclaim Secondary Roads																					
Regrade Roads/Place Growth Media/Seed																					
Monitor Revegetation																					
Wells																					
Lysimeters, Monitor/Production Well Installation																					
Monitor Well Abandonment																					
Production Well Abandonment																					

Table 2-8. Conceptual Schedule of Authorized Mining, Processing, and Reclamation of Authorized Facilities

Activity	Year[1]																				
	2014	*2015*	*2016*	*2017*	*2018*	*2019*	*2020*	*2021*	*2022*	*2023*	*2024*	*2025*	*2026*	*2027*	*2028*	*2029*	*2030*	*2031*	*2032*	*2033*	*2034*
Exploration																					
Construct Exploration Roads, Pads, and Drill (Plan of Operations Exploration)																					
Hole Abandonment																					
Regrade Yards/Place Growth Media/Seed																					
Monitor Revegetation																					

Source: SRK 2014a.

Denotes an operations activity

Denotes a reclamation activity

[1] This conceptual schedule is a representation of the sequencing of the operations for the mine from initiation to closure. However, the actual timing is conditional on various factors such as, but not limited to, permitting and economics. The year 2014 is the year the EIS process was initiated.

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2.3 Proposed Action

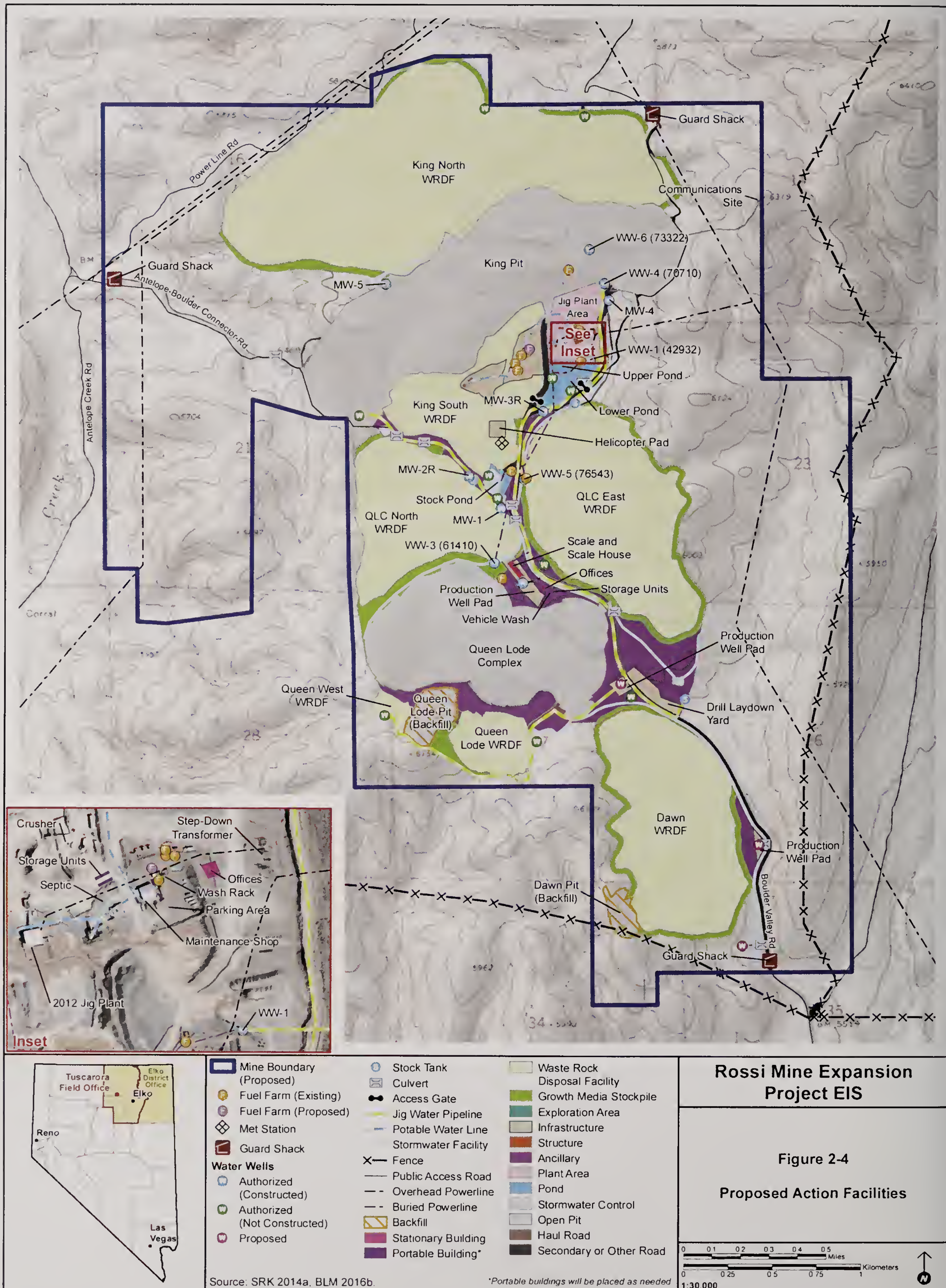
2.3.1 Overview

HES proposes to expand existing operations at the Rossi Mine with the intent of increasing production rates of processed barite ore. HES submitted a PoO (NVN-070547) modification and Reclamation Permit Application (No. 0257) (SRK 2014a) for the expansion of the Rossi Mine to the BLM in August 2014 in compliance with BLM regulations (43 CFR Subpart 3809) and NDEP regulations governing the reclamation of mined lands (Nevada Administrative Code [NAC] 519A.010-635).

The proposed Rossi Mine Expansion Project includes:

- Expansion of the PoO boundary;
- Expansion of the existing King Pit;
- Expansion of the existing Queen Lode and QLEE pits into the QLC Pit;
- Development of the Dawn Pit;
- Expansion of the existing King North WRDF;
- Construction of three new WRDFs (QLC North, QLC East, Dawn);
- Expansion or improvement of existing ponds for water storage and supply;
- Expansion and development of roads;
- Installation of buried power distribution lines within the PoO boundary only;
- Installation of a short-wave communications tower;
- Installation of a helicopter landing pad;
- Exploration throughout the project area; and
- Expansion or modification of ancillary support facilities.

Figure 2-4 displays the locations of facilities and operations under the Proposed Action.



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No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notice.

2.3.2 Surface Ownership and Land Disturbance

2.3.2.1 Surface Ownership

The Rossi Mine PoO area under the Proposed Action includes approximately 3,731 acres as shown in **Table 2-9**.

Table 2-9. Land Status of the Proposed Action PoO

Ownership Status	Township, Range, and Sections[1]	Total Study Area Acreage
Proposed Action – Rossi Mine Expansion		
Private – Barrick Gold Exploration Inc.	T37N, R49E sections 14, 15, 21, 22, 27 and 28	215
Public – BLM Elko District Office	T37N, R49E sections 14, 15, 16, 21, 22, 23, 26, 27, 28, 34 and 35	3,516
Total		**3,731**

Source: SRK 2014a.

[1] Acreage of public and private land varies by section.

2.3.2.2 Land Disturbance

New surface disturbance under the Proposed Action would include a total of 1,167 acres of public and private land as shown in **Table 2-10**. The total project disturbance would include 896 acres of previously authorized disturbance for a total disturbance of 2,063, of which 1,854 acres would be on public land and 209 acres located on private land.

Table 2-10. Authorized and Proposed Action Disturbance Acreages

Facility	Proposed Action						Total Disturbance		
	Authorized Disturbance[3]			New Disturbance					
	Public (acres)	*Private (acres)*	*Total (acres)*	*Public (acres)*	*Private (acres)*	*Total (acres)*	*Public (acres)*	*Private (acres)*	*Total (acres)*
Pits									
King Pit	87.0	165.4	252.4	58.1	-	58.1	145.1	165.4	310.5
Queen Lode Pit[5]	-	13.9	13.9	0.1	2.1	2.2	0.1	16.0	16.1
Queen Lode Complex[1] (QLC)	50.2	7.5	57.7	133.9	1.7	135.6	184.1	9.2	193.3
Dawn Pit[6]	-	-	-	9.0	-	9.0	9.0	-	9.0
Pit Subtotal	**137.2**	**186.8**	**324.0**	**201.1**	**3.8**	**204.9**	**338.3**	**190.6**	**528.9**
Waste Rock Disposal Facilities (WRDF)/Growth Media Stockpiles									
King North WRDF	286.3	-	286.3	125.3	-	125.3	411.6	0	411.6
King South WRDF	102.5	5.9	108.4	-	-	-	102.5	5.9	108.4
Queen West WRDF	3.8	3.3	7.1	-	-	-	3.8	3.3	7.1
Queen Lode WRDF	32.2	0.2	32.4	1.2	-	1.2	33.4	0.2	33.6
QLC East WRDF	0.8	-	0.8	196.8	-	196.8	197.6	-	197.6
QLC North WRDF	0.7	-	0.7	127.8	-	127.8	128.5	-	128.5
Dawn WRDF	-	-	-	182.3	-	182.3	182.3	-	182.3
Growth Media Stockpiles	3.8	0.6	4.4	91.3	1.7	93.0	95.1	2.3	97.4
WRDF/Stockpile Subtotal	**430.1**	**10.0**	**440.1**	**724.7**	**1.7**	**726.4**	**1,154.8**	**11.7**	**1,166.5**
Roads									
Haul Roads	1.4	-	1.4	1.1	0.4	1.5	2.5	0.4	2.9
Secondary Roads	7.2	-	7.2	40.6	-	40.6	47.8	-	47.8
Roads Subtotal	**8.6**	**-**	**8.6**	**41.7**	**0.4**	**42.1**	**50.3**	**0.4**	**50.7**

Table 2-10. Authorized and Proposed Action Disturbance Acreages

Facility	Proposed Action						Total Disturbance		
	Authorized Disturbance[3]			New Disturbance					
	Public (acres)	*Private (acres)*	*Total (acres)*	*Public (acres)*	*Private (acres)*	*Total (acres)*	*Public (acres)*	*Private (acres)*	*Total (acres)*
Exploration Activities									
Exploration Activities	56.0	-	56.0	67.0	-	67.0	123.0	-	123.0
Monitoring Wells	1.5	0.2	1.7	0.5	-	0.5	2.0	0.2	2.2
Exploration Subtotal	**57.5**	**0.2**	**57.7**	**67.5**	**-**	**67.5**	**125.0**	**0.2**	**125.2**
Operations									
Ponds	17.6	-	17.6	0.7	-	0.7	18.3	-	18.3
Jig Plant/Processing Area	28.1	-	28.1	0.1	-	0.1	28.2	-	28.2
Stormwater Controls	0.2	-	0.2	18.9	-	18.9	19.1	-	19.1
Other Support Facilities[2]	14.3	4.9	19.2	105.8	0.6	106.4	120.1	5.5	125.6
Operations Subtotal	**60.2**	**4.9**	**65.1**	**125.5**	**0.6**	**126.1**	**185.7**	**5.5**	**191.2**
Total[4]	**694**	**202**	**896**	**1,161**	**7**	**1,167**	**1,854**	**209**	**2,063**

Sources: SRK 2014a; HES 2016b.

[1] Formerly the Queen Lode Eastern Extension (QLEE).
[2] Includes fuel storage, solid/petrol waste containers, vehicle wash, maintenance pad, buried power distribution lines, helicopter pad, fire break, and communication tower.
[3] Acreages of Authorized Facilities are those that would be included in the Proposed Action if approved. These acreages vary slightly from those reported in **Table 2-3,** as the acreages of selected previously authorized facilities would be reallocated to those identified under the Proposed Action.
[4] Totals have been rounded to the nearest integer and may vary due to rounding.
[5] The 16.1 acre Queen Lode Pit would be completely backfilled (13.9 acres existing/authorized disturbance + 2.2 acres of new disturbance).
[6] The 9.0 acre Dawn Pit would be completely backfilled.

2.3.3 Use and Occupancy of Public Lands

Subpart 3715 of 43 CFR identifies the requirements for use and "occupancy of public lands for the development of locatable mineral deposits by restricting such use or occupancy to that which is reasonably incident." HES is required to meet the specific conditions outlined in 43 CFR Subpart 3715.3-2 as the Proposed Action would include a total disturbance of 2,063 acres, of which 1,854 acres would be on public land managed by the BLM and 209 acres located on private land. In order to delineate the active mining area, the active mining area would be fenced and/or signed. Public access would be restricted and require assistance from HES personnel on the mine site in order to protect the public from potential hazardous situations that can arise at a mine site and to protect the mine facilities and equipment from vandalism or damage from the public. The area within the project boundary that is not occupied by the active mining operations would be open to public access including the exploration area, Boulder Valley Road, and Antelope-Boulder Connector Road. Fences and all signs installed on public lands would be approved by the BLM. The occupancy and use requirements do not allow individuals to live on-site unless requirements under 43 CFR 3710 (Subpart 3715.1-2) are met. A programmatic EA for mining claims, mill site use, and occupancy for selected actions was completed by the Nevada State Office of the BLM with a finding of no significant impact (BLM 2000a). The programmatic EA provides the basis for HES's proposed use and occupancy of public lands. This EIS provides site specific analysis of the Proposed Action.

2.3.4 Schedule and Workforce

At current production rates, authorized operations allow mining in the King Pit until 2018 and the Queen Lode Pit and the QLEE Pit until 2019. Under the Proposed Action, mining operations would be extended for an additional 8 years. A summary of proposed mining, processing, and reclamation schedule is provided in **Table 2-11.**

The proposed project would require a workforce of up to 433 personnel (HES 2014a, SRK 2014a), including up to:

- 60 HES geologists, engineers, and jig plant operators;
- 300 mining contractors;
- 50 short-term construction workers; and
- 23 trucking/road maintenance contractors

Table 2-11. Conceptual Schedule for Mining, Processing, and Reclamation under the Proposed Action

Activity	Year																
	1[1]	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Pits																	
King Pit																	
Pit Excavation																	
Post-mining Berm Construction																	
Queen Lode Pit																	
Pit Excavation																	
Post-mining Berm Construction																	
Queen Lode Complex																	
Salvage Growth Media																	
Pit Excavation																	
Post-mining Berm Construction																	
Dawn Pit																	
Salvage Growth Media																	
Pit Excavation																	
Pit Backfill																	
Waste Rock Disposal Facilities (WRDF)																	
King North WRDF																	
WRDF Operation																	
Recontour/Place Growth Media/Seed																	
Monitor Revegetation																	
King South WRDF																	
WRDF Operation																	
Recontour/Place Growth Media/Seed																	
Monitor Revegetation																	
King South WRDF Infill																	
Recontour/Place Growth Media/Seed																	
Monitor Revegetation																	
Queen Lode WRDF																	
WRDF Operation																	
Recontour/Place Growth Media/Seed																	
Monitor Revegetation																	
Queen Lode Pit backfill																	
WRDF Operation																	
Recontour/Place Growth Media/Seed																	
Monitor Revegetation																	

Table 2-11. Conceptual Schedule for Mining, Processing, and Reclamation under the Proposed Action

Activity	Year																
	1[1]	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Queen West WRDF																	
WRDF Operation																	
Recontour/Place Growth Media/Seed																	
Monitor Revegetation																	
QLC North WRDF																	
Salvage Growth Media																	
WRDF Construction																	
Recontour/Place Growth Media/Seed																	
Monitor Revegetation																	
QLC East WRDF																	
Salvage Growth Media																	
WRDF Construction																	
Recontour/Place Growth Media/Seed																	
Monitor Revegetation																	
Dawn WRDF																	
Salvage Growth Media																	
WRDF Construction																	
Recontour/Place Growth Media/Seed																	
Monitor Revegetation																	
Jig and Operations Areas																	
Buildings and Facilities																	
Operate Jig Plants																	
Demolition or Removal of Buildings, Facilities, and Supplies																	
Regrade Yards/Place Growth Media/Seed																	
Monitor Revegetation																	
Ponds																	
Operate and Modernize Ponds																	
Evaporate Water and Consolidate																	
Regrade/Place Growth Media/Seed																	
Monitor Revegetation																	
HDPE-lined Facilities																	
Operate and Modernize Facilities																	
Remove Liners and Dispose																	
Sample/Analyze Underlying Soils																	
Regrade Yards/Place Growth Media/Seed																	
Monitor Revegetation																	

Table 2-11. **Conceptual Schedule for Mining, Processing, and Reclamation under the Proposed Action**

Activity	Year																
	1[1]	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Infrastructure																	
Jig Water Corridor Pipeline																	
Operate Pipeline																	
Decommission Pipeline																	
Scarify and Seed																	
Monitor Revegetation																	
Electrical Power Service																	
Construct and Operate Electrical Service																	
Decommission Service																	
Scarify and Seed																	
Monitor Revegetation																	
Stormwater Controls																	
Construct and Operate																	
Monitor Operation																	
Roads																	
Haul Roads																	
Construct and Operate Haul Roads																	
Regrade Roads/Place Growth Media/Seed																	
Monitor Revegetation																	
Secondary Roads																	
Construct and Operate Secondary Roads																	
Regrade Roads/Place Growth Media/Seed																	
Monitor Revegetation																	
Public Access Roads																	
Construct Public Access Roads																	
Wells																	
Lysimeter Construction and Operation																	
Lysimeter Abandonment																	
Monitor Well Operation																	
Monitor Well Abandonment																	
Production Well Construction and Operation																	
Production Well Abandonment																	
Remove Well House or Pad																	

Table 2-11. Conceptual Schedule for Mining, Processing, and Reclamation under the Proposed Action

Activity	Year																
	1[1]	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Exploration																	
Construct Exploration Roads, Pads, and Drill (Plan of Operations Exploration)																	
Hole Abandonment																	
Regrade Yards/Place Growth Media/Seed																	
Monitor Revegetation																	

Source: SRK 2014a.

Denotes an operations activity

Denotes a reclamation activity

[1] Approximate start date of 2018.

2.3.5 Open Pits

Under the Proposed Action, conventional open pit mining methods would continue to be used during operations to mine ore and waste rock from the open pits as discussed in Section 2.2.4.1, Open Pits. Under the Proposed Action, mining operations would be conducted 24 hours per day, 7 days per week.

The design of pit expansion and construction under the Proposed Action has been developed based on the configurations of the ore bodies as defined during exploration drilling, HES's experience in similar rock types at the existing mine, the results of geotechnical testing, hydrological studies, and surface mining industry and MSHA standards. Geologic structural mapping, open pit wall and groundwater level monitoring would be conducted during mining to optimize pit design and ensure pit stability during operations. Slope movement monitoring would be continued to evaluate the safety of open pit high walls. In addition, operational procedures for controlling blasting and bench scaling would facilitate mining of stable open pit walls. Accumulations of water resulting from meteoric precipitation within the open pits would be removed by HES during mining operations and used for fugitive dust control.

Safety barriers, such as berms, fencing, and other appropriate measures including signs would be installed as necessary to deter access to pit areas in accordance with BLM, MSHA, and NDEP-BMRR regulations.

2.3.5.1 King Pit Expansion

Under the Proposed Action, the existing King Pit would be expanded to access and mine the ore deposit and would result in an increase of disturbance acreage in comparison to existing authorizations (**Table 2-10**). A summary of King Pit design parameters and anticipated waste rock tonnages is shown in **Table 2-12**. Overall pit slope angles would average 40 to 45 degrees similar to pit slope angles under currently authorized operations. Final overall pit slope angles would be designed using a pit slope safety factor obtained from geotechnical evaluations, slope stability analysis and modeling conducted by HES. A factor of safety is used to provide a design margin to ensure that a slope is stable and would not experience large scale slumping or sliding. A conceptual pit cross section design is displayed in **Figure 2-5**.

Ore tonnages recovered from open pits are considered confidential information and are submitted to the BLM separate from the PoO for the Rossi Mine Expansion Project. Under the Proposed Action, active mining within the King Pit would continue through year 1 and the open pit could be partially backfilled at the end of mining operations. Post-mining safety berms would be constructed at access points to the pit area and along the high wall at the end of mining operations for public safety.

Table 2-12. Proposed Action Open Pit Design Parameters and Approximate Waste Rock Tonnages

Pit	Width (feet)	Length (feet)	Depth (feet bgs)	Pit Bottom Elevation (feet amsl)	Waste Rock (MT)	
					Authorized	*Proposed*
King Pit	2,063	7,509	500	5,325	40.0	-
Queen Lode Complex (QLC)	2,231	4,389	785	5,285	3.5	141
Dawn Pit	504	894	215	5,800	-	2.5
Total					**43.5**	**143.5**

Sources: SRK 2014a; HES 2016b.

2.3.5.2 Queen Pit Expansion

Under the Proposed Action, the existing and authorized Queen Lode Pit and QLEE would be expanded to access and mine ore deposits and would result in an increase of disturbance acreage in comparison to existing authorizations (**Table 2-10**). The expanded facilities would be renamed the QLC Pit (**Figure 2-4**).

A geotechnical evaluation was recently completed to evaluate the stability of the bedrock material to be exposed in the proposed QLC Pit and provide recommendations for design of the pit slopes (Sacrison Engineering 2015). The geotechnical evaluation was based on the results of geotechnical data collection that included drilling and logging seven geotechnical core holes, laboratory testing to provide strength data for use in stability analysis, fracture orientation analysis, and slope stability analysis. Slope design recommendations were developed to satisfy a minimum static factor of safety of approximately 1.0 or greater for all of the pit slopes. A factor of safety is used to provide a design margin to ensure that a slope is stable and would not experience large scale slumping or sliding. Final overall pit slope angles would be designed using pit slope safety factor recommendations by the Sacrison Engineering report in coordination with the BLM and the NDEP-BMRR (Sacrison Engineering 2015). The final pit design would be developed prior to initiation of mining and modified as necessary as mining progresses and the actual geologic conditions and pit wall performance are verified. A summary of QLC Pit design parameters and anticipated waste rock tonnages is shown in **Table 2-12**.

Under the Proposed Action, active mining within the QLC Pit would continue through year 8. The open QLC pit would not be backfilled at the end of mining operations. Post-mining safety berms would be constructed at access points and along the high wall to the pit area at the end of mining operations for public safety.

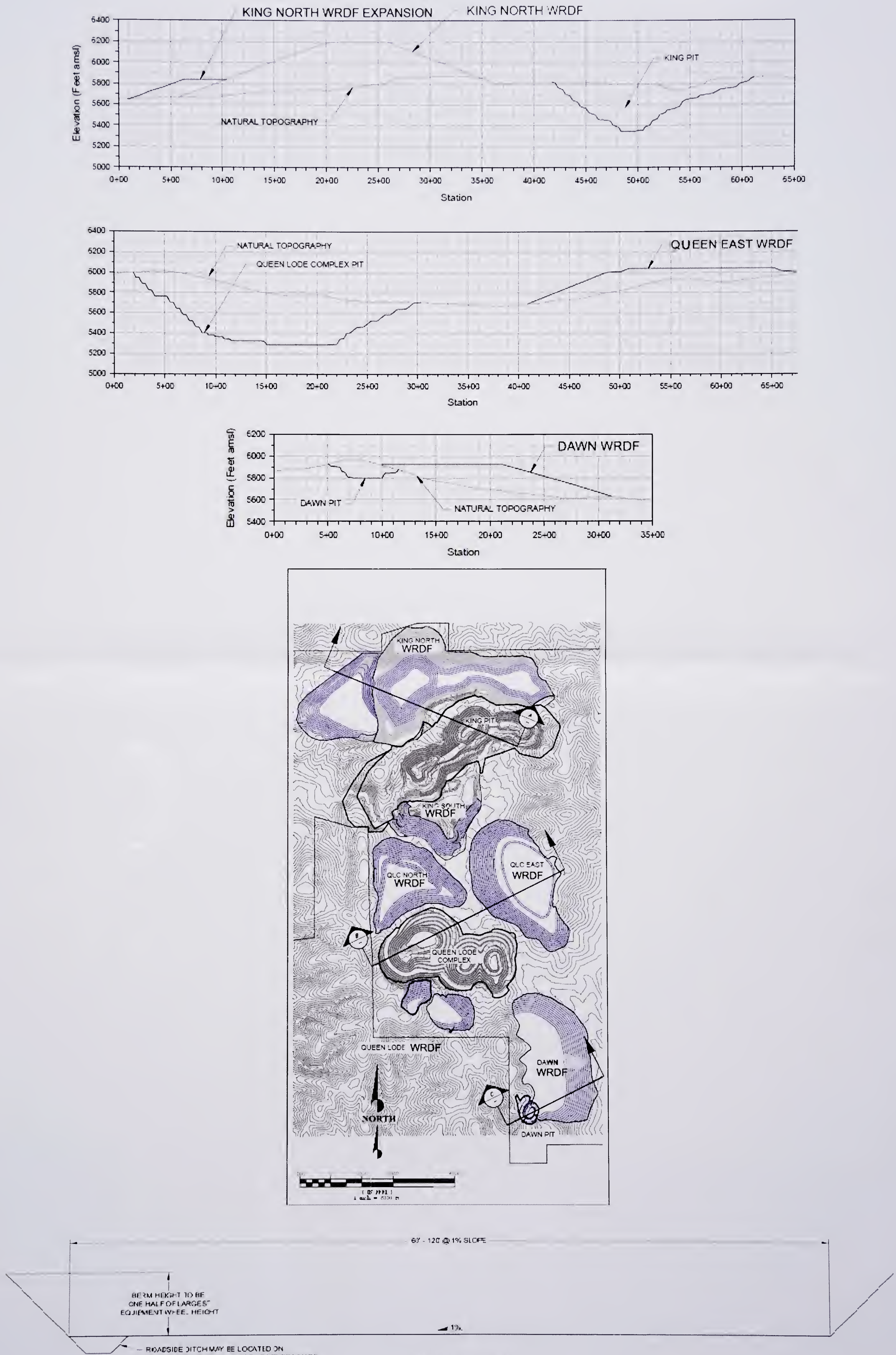
2.3.5.3 Dawn Pit Construction

Under the Proposed Action, the Dawn Pit would be developed to access ore deposits at a previously unmined location as shown in **Figure 2-4**. Development of the Dawn pit would result in approximately 9 acres of new surface disturbance (**Table 2-10**).

Overall Dawn Pit slope angles would average 40 to 45 degrees similar to pit slope angles under currently authorized operations. Final overall pit slope angles would be designed using pit slope safety factor obtained from geotechnical evaluations, slope stability analysis, or modeling conducted by HES. A factor of safety is used to provide a design margin to ensure that a slope is stable and would not experience large scale slumping or sliding. A summary of Dawn Pit design parameters and anticipated waste rock tonnages is shown in **Table 2-12**.

Under the Proposed Action, active mining within the Dawn Pit would begin in year 2 of the project and continue through year 3 (**Table 2-11**). The Dawn Pit would be backfilled at the end of mining operations with waste rock produced from the QLC Pit. In addition to backfilling the Dawn Pit, additional waste rock material from the QLC Pit would be placed in the Dawn WRDF adjacent to the backfilled Dawn Pit. Prior to the local fall mule deer migration, HES would work with BLM and NDOW to minimize migration disruption until the Dawn Pit is backfilled and Dawn WRDF is reclaimed. At the end of mining operations the backfilled Dawn Pit and Dawn WRDF would be re-contoured to match surrounding topography and reclaimed according to BLM and NDEP-BMRR standards.

Figure 2-5. Conceptual Open Pit, WRDF, and Haul Road Section Designs



Source: SRK 2014a.

Note: Haul road widths vary by location as discussed in Section 2.3.8.1, Haul and Secondary Roads.

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2.3.6 Waste Rock Disposal Facilities

Under the Proposed Action, approximately 143.5 million tons of waste rock would be generated by mining operations in addition to the 43.5 million tons of waste rock previously authorized to be placed in WRDF at the existing Rossi Mine (**Table 2-12**). The WRDFs would be constructed at the angle of repose during mining operations and then would be contoured up to a 2.5H: 1V to 3H:1V slope and would not exceed an overall 2.5H:1V slope during reclamation. To promote effective drainage of surface water, the top surfaces of proposed WRDFs would be graded at a slope between one and two percent. Conceptual WRDF cross section designs are displayed in **Figure 2-5**.

Waste rock materials placed in the proposed WRDFs would include multiple types of rock generated by mining operations. The majority of waste rock generated from the King and QLC pits would consist of chert from the Vinini geologic formation which exhibits evidence of extensive oxidation; less than one percent of waste rock chert is anticipated to contain un-oxidized sulfide minerals (SRK 2013a). A summary of potential waste rock materials is provided in **Table 2-13**. Detailed information and analysis of waste rock geochemistry under the Proposed Action is presented in Geochemical Characterization Report for the Rossi Mine (SRK 2013a).

Table 2-13. Potential Waste Rock Material Types

Rock Type	Oxidation	Estimated Percentage of Waste Rock	
		King Pit	***QLC Pit***
Alluvium	Oxide	5	5
Chert	Oxide	95	70
	Non-oxide	<1	<1
Tuff	Oxide	<1	15
Intrusive	Oxide	<1	10
Fault Gouge	Oxide	<1	<1
Total		**100**	**100**

Source: SRK 2013a.

2.3.6.1 King North WRDF Expansion

Under the Proposed Action, the King North WRDF would be expanded from current authorizations to result in an increased area of surface disturbance (**Table 2-10**). A summary of design parameters of the proposed King North WRDF expansion is shown in **Table 2-14**. Expansion and operation of the King North WRDF would begin in year 1 and is anticipated to last for approximately 1 year (**Table 2-11**). Expansion of the King North WRDF under previous authorizations is anticipated to continue to cover the drainage and flow from perennial spring 001 (SP-001). Under the Proposed Action, HES would install a subdrain system to ensure spring flows continue to support riparian vegetation within the channel that flows north into Little Coyote Creek. The subdrain system would be constructed beneath the King North WRDF footprint in the existing seep drainage channels by excavating approximately two feet below ground surface and installing a geosynthetic liner in the excavated channel. Approximately four inches of crushed stone would be placed in the base of the lined channel with a perforated drainpipe installed on the stone base. The channel would then be completely backfilled with crushed stone to match existing topography. The flow captured in the subdrain for SP-001 would discharge into the existing unnamed drainage that drains the spring source area. Design specifications and drawings of the proposed French-style drain system are included in the PoO.

Table 2-14. **Proposed Action Waste Rock Disposal Facility Design Parameters**

Waste Rock Disposal Facility	Capacity (MT)	Width (feet)	Length (feet)	Crest Height (feet)	Crest Elevation (feet amsl)
King North Expansion	46.0	3,392	8,386	260	5,840
QLC East	55.5	2,795	4,629	380	6,040
QLC North	38.9	2,825	2,907	325	5,900
Queen West	1.4	349	710	220	6,140
Queen Lode	3.4	1,146	1,557	245	6,050
Dawn	43.6	2,091	4,276	350	5,925

Source: HES 2016c.

2.3.6.2 King South WRDF Drain Installation

Under the Proposed Action the King South WRDF would not be expanded from the previously authorized footprint and dimensions presented in Section 2.4.2.2, Waste Rock Disposal Facilities. Under the Proposed Action, a subdrain system would be installed at the foot of spring 002 (SP-002) to ensure spring flows continue to support riparian vegetation within the unnamed channel that flows to the south from the toe of the existing and previously authorized King South WRDF. The subdrain system would be constructed beneath the King South WRDF footprint in the existing seep drainage channels by excavating approximately two feet below ground surface and installing a geosynthetic liner in the excavated channel. Approximately four inches of crushed stone would be placed in the base of the lined channel with a perforated drainpipe installed on the stone base. The channel would then be completely backfilled with crushed stone to match existing topography. The flow captured in the subdrain for SP-002 would discharge into the existing unnamed drainage that drains the spring source area.

2.3.6.3 QLC East WRDF Construction

Under the Proposed Action, the QLC East WRDF would be developed to store waste rock generated from the QLC Pit. A summary of design parameters of the proposed QLC East WRDF is shown in **Table 2-14**. Construction of the QLC East WRDF would be phased according to the schedule provided in **Table 2-11** to provide mule deer (*Odocoileus hemionus*) access to undisturbed migratory corridor habitat that connects seasonal ranges found in the vicinity of the existing Rossi Mine. The QLC East WRDF would be constructed in phased lifts to allow for concurrent reclamation of disturbance within the migration corridor. Concurrent reclamation of each lift would be implemented upon the completion of each lift and fill material would be placed in each lift in a sequence intended to minimize the disturbance to the migratory habitat.

2.3.6.4 QLC North WRDF Construction

Under the Proposed Action, the QLC North WRDF would be developed to store waste rock generated from the QLC Pit. A summary of design parameters of the proposed QLC North WRDF is shown in **Table 2-14**. Construction of the QLC North WRDF would be phased according to the schedule provided in **Table 2-11**. The proposed QLC North WRDF and the previously authorized King South WRDF would be separated by the Antelope-Boulder Connector Road. Discussion of the previously authorized King South WRDF is presented in Section 2.2.4.2, Waste Rock Disposal Facilities.

2.3.6.5 Queen West WRDF Expansion

Under the Proposed Action, the Queen West WRDF would be expanded from previous authorizations to store waste rock generated from the QLC Pit and incorporates the previously authorized Queen West WRDF and the backfill area of the Queen Lode Pit. A summary of design parameters of the proposed

QLC West WRDF is shown in **Table 2-14**. Construction of the Queen West WRDF would be phased according to the schedule provided in **Table 2-11**.

2.3.6.6 Queen Lode WRDF Expansion

Under the Proposed Action, the Queen Lode WRDF would be expanded from previous authorizations to store waste rock generated from the QLC Pit. A summary of design parameters of the proposed Queen Lode WRDF is shown in **Table 2-14**. Construction of the Queen Lode WRDF would be phased according to the schedule provided in **Table 2-11**.

2.3.6.7 Dawn WRDF Construction

Under the Proposed Action, the Dawn WRDF would be developed to store waste rock generated from the Dawn and QLC pits. A summary of design parameters of the proposed Dawn WRDF is shown in **Table 2-14**. Construction of the Dawn WRDF would be phased according to the schedule provided in **Table 2-11**. The QLC East WRDF would be constructed in phased lifts to allow for concurrent reclamation of disturbance within mule deer migration habitat. As areas of the Dawn WRDF are completed, concurrent reclamation of the lower slopes of the WRDF would be implemented as feasible to reduce impacts upon mule deer migration habitat. Prior to the local fall mule deer migration, HES would work with BLM and NDOW to minimize migration disruption until the Dawn WRDF is backfilled and reclaimed.

2.3.7 Ore Processing

2.3.7.1 Ore Stockpiles

Ore stockpiling would continue similar to existing authorizations. The number of ore stockpiles present within the operations area would vary dependent on mining activity, jig plant processing rates, and the barite content of mined ore deposits.

2.3.7.2 Ore Crushing

Ore crushing operations under the Proposed Action would continue as currently conducted under existing authorizations.

2.3.7.3 Jig Plant Processing

Ore processing under the Proposed Action would continue as currently conducted under current authorizations. Upgrades to the water conservation system used during jig plant processing have been previously authorized but have yet to be constructed. HES would continue to implement the water conservation system.

2.3.8 Haul, Secondary, and Public Access Roads

2.3.8.1 Haul and Secondary Roads

Under the Proposed Action new haul roads would be constructed as shown in **Figure 2-4** and **Figure 2-5**, representing a surface disturbance acreage of 3 acres. The area of surface disturbance resulting from haul roads would vary over the life of mining operations as haul roads can be located within the disturbance footprint of pits and WRDFs and are developed concurrent with mining progress. Within areas that have already been disturbed by mining activity (e.g., WRDF and open pits) haul roads would be constructed at 60 to 120 feet in width to allow for haul truck maneuvering. In areas outside of previous disturbance, haul roads would be constructed to be 40 to 80 feet wide. Haul roads would have parallel berms constructed in accordance to MSHA regulations (30 CFR §56.9300[b]) requiring berms be constructed at least mid-axle height or half the tire height of the largest piece of equipment that would use the road. Gaps would be constructed in berms approximately every 500 feet or where terrain or topographical features create a natural path to facilitate wildlife movement. The bottom of the gap would be placed up to 1 foot above the surface of the roadbed to allow for drainage. The gaps would range in

width from 3 to 4 feet wide. The fill slope of the road would be ramped leading up to each gap. The gaps would be placed on both sides of the haul road across from each other to provide a direct movement across the haul road unless the terrain dictates that the gaps be placed off-set to enhance wildlife movement.

Secondary exploration roads would be constructed with an approximate average running surface of 14 feet which would vary dependent upon topography. Secondary roads would have parallel berms constructed in accordance to MSHA safety regulations. Maintenance of haul and secondary roads would be conducted by HES and include: periodic grading and resurfacing, stormwater water control monitoring and maintenance, snow removal, graveling as necessary, and fugitive dust suppression. Application of magnesium chloride may be used as necessary, to control fugitive dust and maintain safe driving conditions.

2.3.8.2 Access Roads

Public access roads would remain open during mining operations but could be temporarily restricted for safety and security reasons. In order to maintain public access through the Rossi Mine area, approximately 2,879 feet of the Antelope-Boulder Connector Road would be re-routed around the west end of the proposed King Pit Expansion as shown in **Figure 2-3**. In addition, approximately 2,890 feet of the Boulder Valley Road would be re-routed around the east end of the proposed QLC Pit and approximately 1,950 feet of the Boulder Valley Road would be re-routed around the east end of the proposed expanded King Pit as shown in **Figure 2-3**. Public use of these access roads would be temporarily modified during construction periods. Public traffic may be temporarily stopped or diverted depending on mine site construction and development activities, mining operations, blasting, and weather conditions. Closures of the public access road would be temporary and would only be implemented as necessary. HES construction staff would use appropriate signage and flagmen to alert public traffic of all changes in road conditions and hazardous areas.

Access road maintenance would be conducted on an as needed basis and would vary dependent upon weather and seasonal traffic patterns. Maintenance actions could include snow removal, blading/grading, rut repair, gravelling, culvert repair, and dust suppression treatment. Application of magnesium chloride may be used as necessary, to control fugitive dust and maintain safe driving conditions. HES would maintain access roads during periods of active mine operations.

2.3.9 Ancillary and Support Facilities

2.3.9.1 Buildings and Structures

Under the Proposed Action, multiple buildings and structures would be constructed within the existing processing area including:

- Two permanent office buildings;
- Two portable office buildings;
- Two vehicle wash facilities;
- One lined maintenance pad;
- One truck scale and scale house;
- One communication tower; and
- Multiple portable storage units.

2.3.9.2 Lighting

Operational lighting under the Proposed Action would be the same as described for the existing authorized facilities with additional lighting installed for the new buildings and structures described above. All fixtures would continue to be positioned to shine light downward and include either light shields or screens in an effort to minimize light pollution. Lighting would only be used when necessary for operational and mining staff safety and would be directed to avoid light pollution onto any adjacent lands

when viewed from a distance. HES maintains a Rossi Mine Lighting Management Plan as an appendix to the PoO for existing and proposed operations that would require the use of permanent and temporary lighting. To ensure that potential adverse lighting impacts are minimized to the extent possible without compromising worker safety, HES would utilized the following LMP controls and BMPs:

- Fixed, permanent lighting associated with mine infrastructure (buildings and trailers) is designed to avoid or minimize adverse lighting or lighting spill effects to non-operational areas, near the Project boundary or any potential off-site viewing locations;
- Temporary, mobile light plants for mine operations and exploration would be located and positioned to avoid or minimize adverse lighting or lighting spill effects to non-operational areas, near the Project boundary or any potential off-site viewing locations. Temporary lights would only be used when necessary;
- Mobile mine equipment and light plants would be shielded, screened and faced downward towards the ground to avoid or minimize adverse light impacts;
- Support the installation of new permanent lighting infrastructure and the removal of mobile lighting plants, where practical;
- Total adverse lighting impacts from the Project would be minimized, to the extent practical; and
- Any public complaints that relate to lighting at the Project would be recorded, managed and responded to in an expedient manner by HES.

Proposed operations within the active pit areas, ready lines, and WRDFs would use mobile, diesel-powered light plants at night to allow HES to conduct mining operations safely and efficiently and to comply with MSHA illumination requirements. Areas would be temporarily lit using light plants only when active mining or exploration is taking place. Light plants would be powered by internal six kilowatt diesel powered generators.

2.3.9.3 Power Supply

Under the Proposed Action, the existing 24.9 kV distribution line from the step-down converter located on the east side of the jig plant area would be extended to provide power to the jig plant area, the potable water system, production wells, ready line, maintenance areas, and office buildings located within the project area. Approximately 7,920 feet of new 24.9 kV distribution line would be installed within the PoO boundary of which, approximately 313 feet would be located within the existing jig plant area. All new distribution line extensions would be buried underground in conduit according to industry standards. No new distribution or transmission lines are proposed outside of the PoO boundary. Facilities and equipment within the PoO boundary that are not supplied by the existing power line or proposed power line extension would continue to be supplied by mobile diesel generators including well sites, construction sites, maintenance sites, and equipment parking areas.

2.3.9.4 Fuel

Under the Proposed Action, the rate of fuel and hydrocarbon use would increase to support the proposed increase in mining production. Construction of an additional 40 foot wide by 80 foot long fuel farm is proposed to be located near the jig maintenance shop within the jig plant area (**Figure 2-4**). The rate of fuel deliveries to the existing and proposed fuel farms would increase accordingly. Information on specific fuels and hydrocarbons used during mining operations is contained in **Table 2-6** and the Rossi Mine Spill Prevention Control and Countermeasures Plan (SPCCP) (SRK 2014a). Storage of fuels and hydrocarbons would be located within secondary containment areas and conducted and signage posted according to federal, state, and local requirements. Concrete secondary containment may be constructed to replace authorized HDPE-lined containments for fuel farms.

2.3.9.5 Sanitary and Solid Waste Disposal

HES would continue to collect and transport all solid waste generated within the Rossi Mine site in approved containers. Solid waste containers would be transported via truck to an approved off-site solid waste disposal landfill. Petroleum-contaminated soils resulting from spills or leaks of hydrocarbons would

be removed from the spill site and placed in a dedicated container and transported off-site to an approved facility in accordance with federal, state, and local regulations. Multiple solid waste containers would continue to be located within the processing area during operations.

An underground holding tank receives domestic sanitary waste from the mine office and lunch/change room portable buildings (permitted under NDEP Discharge Permit NS2015508). This tank is pumped regularly and disposed offsite as permitted.

2.3.9.6 Site Security, Signs, and Fencing

Site signage and fencing under the Proposed Action is the same as described for currently authorized operations. If required by MSHA regulations in the future, security guard shacks and/or security gates would be placed at each of the three main public access points for public safety, as shown on **Figure 2-4**. Guard shacks would be approximately 50 square feet in size and would be placed inside the Project boundary but prior to public road access of active mining operations. The guard shacks would be either permanent or temporary structures and would conform with BLM Color Chart CC-01. Power for the guard shacks would be provided by underground power lines.

2.3.9.7 Hazardous Materials, Hazardous Waste Management, and Solid Waste

Fuels and hydrocarbons used during mining and processing operations would continue to be stored in areas protected by secondary containment measures that include double-walled tanks or HDPE containment. A list of fuels and hydrocarbons proposed for use during mining and processing operations, proposed storage quantities, and proposed usage rates under the Proposed Action is provided in **Table 2-6**. Used oils and solvents would be stored and characterized according to requirements of RCRA. Used oil and coolant fluid would be stored at the maintenance shop under appropriate secondary containment. The used coolant and oil would not be mixed and would either be recycled or disposed of in accordance with state, federal, and local regulations. Used containers would also be disposed or recycled according to federal, state, and local regulations.

HES maintains a waste management plan that identifies waste generated at the mine site and their appropriate means of disposal. Mine staff would continue to be trained in proper handling, storage, and emergency procedures relevant to their responsibilities; contractors transporting and disposing of these materials would continue to be certified by NDOT and the NDEP-BMRR.

Blasting material and other hazardous explosives would continue to be stored, handled, and used according to MSHA and ATF regulations in addition to other federal, state, and local statutes and regulations.

HES would keep an inventory of hazardous materials in accordance with federal, state, and local regulations. Material safety data sheets would be kept on materials and made available to employees through training and placement of resource sheets at various stations on the project. Solid waste would be collected and transported off-site periodically for disposal at an approved solid waste facility. Petroleum-contaminated soils would be placed in designated containers for periodic offsite disposal at an approved facility. Petroleum products are excluded as hazardous substances under the Comprehensive Environmental Response, Compensation, and Liability Act section 101(14). Diesel, oil, and lubricants would be stored on-site within secondary containment. Spills of regulated materials (petroleum products) would be handled in accordance with the SPCCP. Explosive materials transportation and storage are managed by the mining contractor within the Project area in accordance with federal, state, and local regulations.

2.3.9.8 Public Safety and Fire Prevention and Protection

Signs and berms would be installed around the pit areas to warn the public of a potential hazard. Signs indicating the transition to a left-hand traffic pattern, speed limits, radio channel contacts, authorized personnel only areas, emergency contacts and procedures, and visitor check-ins would be posted.

The project would operate in conformance with all MSHA safety regulations (30 CFR Parts 1-199). HES would comply with applicable federal and state fire laws and regulations and would take reasonable

measures to prevent and suppress fires in the area of operations including maintenance of a firebreak located around the periphery of the jig plant processing area. HES and contractors are required to carry fire extinguishers, hand tools, and/or backpack-type water pumps in their vehicles to suppress small fires. A firebreak is authorized along the eastern boundary of the operations to protect from and limit the spread of wildland fires. Proposed roads would function as firebreaks, keeping wildland fires away from structures and providing firefighting access into the area.

2.3.9.9 Water Supply, Demand, and Management

Water supply, demand, and management would be the same as described for the existing and currently authorized operations with differences noted as follows. Under the Proposed Action, water used in jig plant processing and dust suppression would continue to be supplied by the existing production wells and from the existing Barrick Goldstrike Mine dewatering program via truck delivery. Under the Proposed Action, up to three additional production wells are proposed to be drilled as shown on **Figure 2-4**. Wells would be drilled on pads approximately 600 feet by 600 feet and multiple sumps would be excavated within each well pad. Completion of the proposed water production wells would be completed at below ground depths between 1,000 to 4,000 feet (SRK 2014a). Potable water would continue to be supplied from produced water, stored in a tank within the existing office area, and treated to meet applicable drinking water standards.

Water Quality is monitored for compliance with Water Pollution Control Permit NEV2015115. HES maintains a Water Quality Monitoring Program for quality assurance. Surface and groundwater samples are collected by a contractor or qualified HES personnel. Samples are analyzed by a State of Nevada certified laboratory and water quality reports are submitted to NDEP-BMRR and BLM.

Existing unlined ponds within the PoO boundary would be modernized to meet NDEP-BMRR permit requirements under NAC 445A but are not required to have liners installed. Engineered designs for updates to pond and associated infrastructure is under development and would be submitted to the BLM and NDEP-BMRR prior implementation and construction of the facility for approval by the BLM and NDEP. Existing ponds would not increase in area or volume but may be modernized as required by NDEP for stormwater containment. As described previously, a water conservation system has been approved by the NDEP-BMRR.

2.3.9.10 Stormwater Management

Stormwater control features would continue to include channels, sediment basins, check dams, and culverts designed to manage 100-year, 24-hour storm events as shown in the Rossi Mine Stormwater Control Design Report (SRK 2014a). Other stormwater controls and Best Management Practices (BMPs), such as but not limited to placement of straw bales, grass wattles, silt fences, or sediment control structures would continue to be maintained in accordance with the Rossi Mine SWPPP (SRK 2014a). BMPs listed in the *Nevada Contractor's Field Guide for Construction Site Best Management Practices* would also be implemented under the Proposed Action (NDEP 2008a).

Stormwater originating from up gradient of the stock pond would be collected, diverted to the stock pond, and used for jig water. Stormwater originating downgradient of the stock pond would be diverted to prevent run-on and run-off from contacting operating areas. Typical cross-sections of stormwater controls are described in the Stormwater Control Design Report, included as Appendix E of the PoO.

Mining facilities would continue to be monitored following spring snowmelt and intense rain events in accordance with the Rossi Mine SWPPP to ensure that drainage and sediment control measures are effective and operating properly. Quarterly inspections and event monitoring would continue to be conducted in accordance with the SWPPP to verify that stormwater controls are functioning as designed. If inspections indicate controls are observed to not be functioning properly, controls would be modified in accordance with the SWPPP.

2.3.9.11 Communication Tower Site

Under the Proposed Action, HES would install a short-wave communications tower on BLM managed lands within the proposed PoO boundary in the southwestern quarter of Section 14, Township 37 North,

Range 49 East (**Figure 2-4**). The tower would be used for on-site mine communications using short-wave and FM radio signals. The communication tower would consist of a self-supporting aluminum lattice structure approximately 30 feet in height and approximately 18 inches wide (HES 2016k). No guy wires or lights would be installed on the tower and the tower itself would be light gray in color. The communications tower site would be accessed for installation and maintenance by HES via the existing secondary road that leads to the existing Coyote Creek communications reflector operated by the Sierra Pacific Power Company (NVN-090441). Installation of the communications tower would include the temporary surface disturbance of an area approximately 20 feet by 20 feet (0.009 acres). The tower would be constructed on a concrete pad with dimensions of 8 feet by 8 feet. Long-term surface disturbance resulting from the operation of the communication tower during the life of the project would result in approximately 64 square feet of disturbance.

2.3.9.12 Helicopter Pad

Under the Proposed Action, a helicopter landing pad would be constructed on the top of the South King WRDF near the meteorological station as shown in **Figure 2-4**. The pad would consist of a flat gravel pad approximately 80 feet wide by 80 feet in length. No lights or automated equipment would be installed within the landing pad site. Use of the landing pad by helicopter would be limited to medical evacuations and other emergency situations.

2.3.10 Exploration

HES would continue to conduct temporary surface disturbance for exploration activities throughout the project area. Exploration activities would include construction of roads and drilling pads, surface sampling, trenching, bulk sampling, geotechnical investigation, geophysical survey, water and monitoring well installation, and drilling using both reverse circulation and core drill rigs. Under the Proposed Action, an additional 67 acres of surface disturbance would result from exploration activities.

Proposed drill pads would be 80 feet by 100 feet (approximately 0.18 acre), and roads would have a 14-foot running width with MSHA-compliant berms. Multiple sumps could be excavated on or off the pad with a maximum size of 40 by 50 feet. Proposed sumps would be constructed with one end sloped to provide egress for wildlife. Sumps would be backfilled as soon as practicable.

HES would continue to prepare work plans describing the type and location of exploration activities for submittal to the BLM and NDEP-BMRR before exploration activity commences. HES would continue to submit an annual report on or before April 15 of each year to the BLM and NDEP-BMRR for the preceding calendar year. The annual report would contain descriptions of the disturbance and reclamation of exploration related activities completed during the previous year. Drill holes would be plugged after data collection is complete, in accordance with NAC 534.425-428. Only two exploration holes would be open per drill rig at the site. Up to five drill rigs could operate at the site, and no more than ten exploration holes would be open at a time.

2.3.11 Growth Media Stockpiles

HES would continue to salvage growth media prior to development or expansion of proposed pits, WRDFs, and other areas of surface disturbance to the extent practicable. Growth media would be supplemented with fine material recovered from sediment ponds located below the jig plant area and stockpiled at the perimeter of WRDFs as shown in **Figure 2-4** Stockpiles would be placed to allow for concurrent reclamation of the lower tier slopes of WRDFs to the extent practicable. To minimize wind and water erosion, the stockpiles would be re-contoured to slopes of 2.5H:1V and seeded with an interim seed mix. Details of the proposed interim seed mix are provided in Section 2.3.12.5, Soil Preparation, Seeding and Planting, and Revegetation.

2.3.12 Closure and Reclamation Plan

HES would reclaim all areas within the PoO boundary disturbed by mining and processing and exploration activities in accordance with BLM and NDEP-BMRR regulations, State of Nevada requirements (NAC 519A), and the approved Rossi Mine Reclamation Plan (No. 0257). Reclamation

activities are designed to meet the BLM regulations contained in 43 CFR 3809 and achieve post-mining land uses consistent with the Elko Resource Area Resource Management Plan Record of Decision (BLM 1987a). The regulations specified in 43 CFR 3809.420 includes both general and resource specific performance standards applicable to Plans of Operations. Specific reclamation standards required under 43 CFR 3809.420 applicable to the Rossi Mine Expansion Project PoO include:

- At the earliest feasible time, the operator shall reclaim the area disturbed, except to the extent necessary to preserve evidence of mineralization, by taking reasonable measures to prevent or control onsite and offsite damage of the Federal lands;
- Saving of topsoil for final application after reshaping of disturbed areas have been completed;
- Measures to control erosion, landslides, and water runoff;
- Measures to isolate, remove, or control toxic materials;
- Reshaping the area disturbed, application of the topsoil, and revegetation of disturbed areas, where reasonably practicable;
- Rehabilitation of fisheries and wildlife habitat; and
- When reclamation of the disturbed area has been completed, except to the extent necessary to preserve evidence of mineralization, the authorized officer shall be notified so that an inspection of the area can be made.

Prior to the anticipated closure of the Rossi Mine, HES would prepare a detailed closure plan conforming to the NDEP mine closure process requirements (NDEP 2016b) and requirements of the Rossi Mine Water Pollution Control Permit. The NDEP mine closure process currently requires the following components:

1. Tentative Permanent Closure Plan – submitted at the time of application for a Water Pollution Control Permit (NAC 445A.398);
2. Final Permanent Closure Plan – submitted at least 2 years prior to the “anticipated permanent closure of that process component” (NAC 445A.447);
3. Final Closure Report – (a) summarizes all completed closure-related activities (i.e., facility characterization, completed earthwork, and monitoring); (b) provides closure-related as-builts, if required; and (c) proposes post-closure monitoring, as applicable; and
4. Request for Final Closure – demonstrates facility stabilization (both chemical and physical) has been achieved and solicits Water Pollution Control Permit retirement.

Once disturbance within a certain area is no longer anticipated, reclamation would occur followed by active monitoring of revegetation success. Vegetation monitoring would be conducted annually for a minimum of 3 years in accordance with the *Nevada Guidelines for Successful Revegetation* (NDEP 2015a). BLM and NDEP-BMRR approved interim and final seeding mixtures would be used to seed re-contoured areas disturbed by mining operations.

2.3.12.1 Post-mining Land Use and Reclamation Goals

Current land use types in the project area include mineral exploration and development, dispersed recreation, livestock grazing, wildlife habitat, utility corridors, and Native American cultural use. These land uses are anticipated to continue to occur following closure and reclamation of the proposed project. HES would coordinate with local agencies and local governments to evaluate potential post-mining alternative land uses that could provide long-term socioeconomic benefits from the mine infrastructure in conformance with the Elko Resource Area Resource Management Plan and Elko County Zoning ordinances.

Current objectives of the closure and reclamation plan include:

- Implementing concurrent reclamation of facilities as soon as practicable during production;
- Providing a stable post-mining landform that supports defined land uses, such as wildlife habitat and domestic livestock grazing;

- Minimizing erosion damage and protect water resources through controlling surface water runoff to limit erosion and sediment transport;
- Constructing stable land forms that blend with existing topography with final slopes not to exceed an angle of 2.5H:1V to 3H:1V overall. Final reclamation contours would be determined through analysis of slope stability data collected during the life of the Rossi Mine and would be consistent with MSHA, Nevada Division of Minerals (NDOM), and BLM standards;
- Establishing post-reclamation surface soil conditions conducive to the regeneration of a stable, diverse, noxious weed-free plant community compatible with land use goals; and
- Maintaining public safety by stabilizing or limiting access to landforms that could constitute a public hazard.
- Limiting and/or eliminating long-term maintenance.

2.3.12.2 Proposed Closure and Reclamation Schedule

HES has submitted a reclamation plan for the proposed mine expansion to the BLM as part of the PoO (SRK 2014a). The proposed project schedule, including reclamation, is discussed in Section 2.3.4, Schedule and Work Force, and presented in **Table 2-11**.

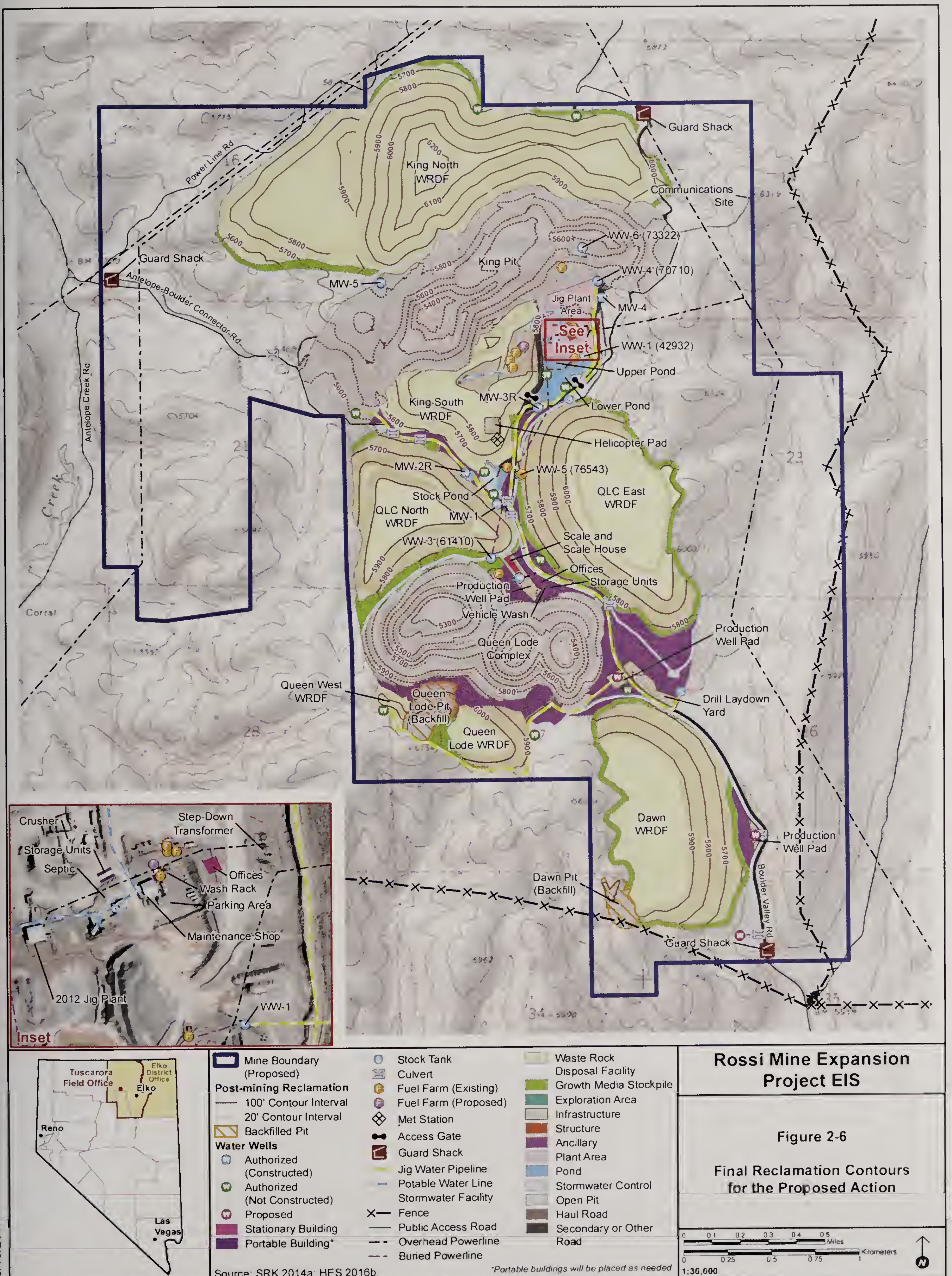
Reclamation would occur concurrently with mining operations as areas become available and when reclamation could be completed in a safe and effective manner. Concurrent reclamation would include recontouring and revegetating completed sections of the WRDFs, as well as other facilities, incrementally during the operating period.

Final reclamation would be completed during a 5-year period following cessation of mining and ore processing operations. Post closure monitoring by NDEP could continue up to 30 years following completion of processing based on current regulations. The duration of the BLM's post-closure monitoring would depend on the project's final closure plan and its implementation. The current 43 CFR 3809 regulations do not have timeframe limitations for closure and reclamation. A plan of operations does not expire or end until the closure and reclamation activities have been satisfactorily and successfully completed as determined by the BLM.

2.3.12.3 Post-mining Contours, Topography, and Regrading

Final grading proposed for the project facilities would provide stability and minimize the visual impact of unnatural lines and landforms. Slopes would be regraded to blend with surrounding topography, interrupt straight-line features, and facilitate revegetation, where practical. Large constructed topographic features, such as WRDFs, would have rounded crests and variable slope angles to resemble natural landforms, to the extent possible.

Topographic forms would be developed to manage surface water and moisture appropriately over the long term. Designs to prevent ponding and snow accumulation would be implemented on facilities where prevention of water infiltration is important. These areas include WRDFs and pit walls due to the need to maintain appropriate conditions that promote slope stability. The preliminary design contours of the reclaimed mine facilities are presented in **Figure 2-6**.



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No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notice.

2.3.12.4 Cover Material

Following disturbed area regrading to final closure topography, facilities would be covered with a simple conventional cover of growth media to support overall vegetation goals and protect water and air resources. The cover would be composed of on-site soil salvaged during mine development. Growth media would be salvaged prior to facility construction using dozers, front-end loaders, haul trucks, scrapers, and other equipment. Growth media stockpiles would be primarily located at WRDF toes and crests.

Based on an Order III Soil Survey of the proposed project area conducted by the Natural Resources Conservation Service (NRCS), a deficit of available cover material within the project area may exist. The deficit is likely due to limited growth media salvaging efforts of previous mine operators prior to 1981. NRCS soils survey results indicate that the average growth media depths are less than the six-inch growth media depth proposed for reclamation.

HES has identified sources of potential alternate growth media that may be used in place of, or in conjunction with, salvaged soils. These alternate media sources include jig fines, weakly lithified conglomerate and mudstone of the Carlin Formation and Carlin Tuff. In order to assess options for achieving successful revegetation of reclaimed areas under the Proposed Action, HES would develop reclamation test plots in coordination with the BLM to evaluate potential approaches to achieving successful revegetation in areas where alternative growth media would be used. Parameters analyzed within test plots would include but are not limited to slope and aspect, potential alternate growth media types, and various cover depths. This study would also include test plots where treatment includes direct seeding onto scarified surfaces and jig fines to assess the potential for revegetation without salvaged growth media.

In 2013, HES conducted an internal analysis of the volume of available native growth media within the project area, the volume of growth media that would be necessary to place a six inch growth media cover during final reclamation, and the volume of available alternative growth media potentially salvaged from jig fines produced during ore processing. The results of the HES analysis concluded that approximately 8,000,000 cubic feet (cf) of native growth media and approximately 6,000,000 cf of jig fines alternative growth media have been stock piled by HES to date (HES 2016d). HES estimates that under the Proposed Action an additional 10,000,000 cf of native growth media would be stockpiled over the 8-year life of the Rossi Mine resulting in a total volume of 24,000,000 cf of stockpiled growth media. HES estimates that under the Proposed Action, an estimated 29,000,000 cf of growth media would be required for mine reclamation, assuming a six inch cover depth. Therefore, a growth media deficit of approximately 5,000,000 cf would exist with respect to the acreage to be covered. To ensure a minimum six inch growth media cover is available for placement during final reclamation, HES would import off-site growth media for selective placement on an as needed basis (HES 2016d). Also, HES may place growth media in various depths, and in selective areas, which would create diversity in seedings and areas of revegetation. The use of various depths of growth media may be used to enhance the planting or seeding of some plant species.

2.3.12.5 Soil Preparation, Seeding and Planting, and Revegetation

Revegetation of disturbed areas would be conducted as soon as practical following regrading and cover placement in order to control runoff, reduce erosion, provided forage for wildlife and livestock, and reduce visual impacts. Revegetation would be accomplished through soil preparation, seeding and planting.

Prior to seeding, the cover material would be ripped or scarified as required to promote water retention, reduce erosion, and prepare the final seed bed. Seed bed preparation would be performed immediately prior to seeding to allow seed placement prior to soil re-compaction. The use of soil amendments would be determined in coordination with the BLM. Seeding would be conducted using hydro-seeding, broadcast, or other suitable methods, such as but not limited to, drill seeding, hand planting, using a broadcast seeder and ATV, and using of a harrow to create a seed-soil contact, depending upon accessibility and site-specific conditions. **Table 2-15** provides information on the proposed interim and final reclamation seed mixes. **Table 2-15** also provides a list of alternative plant species that could be used by HES during reclamation of disturbed areas in the event that proposed reclamation species seed

is unavailable. In addition to seeding disturbed areas for reclamation, HES may also include the use of seedlings from plant species listed in **Table 2-15** in coordination with the BLM.

Table 2-15. Proposed Interim and Final Reclamation Seed Mixes, including Potential Alternative Reclamation Plant Species

Species Common Name (*Scientific Name*)	Application Rate[1] (Pounds per acre)
Interim Seed Mix	
Crested Wheatgrass (*Agropyron cristatum*)	10.0
Small Burnet (*Sanguisorba minor*)	4.0
Fourwing Saltbush (*Atriplex canescens*)	4.0
Final Seed Mix	
Grass Species	
Ephraim Crested Wheatgrass (*Agropyron cristatum* var. *Ephraim*)	0.5
Thickspike Wheatgrass (*Agropyron dasystachyum*)	0.5
Bluebunch Wheatgrass (*Agropyron spicatum*)	3.5
Great Basin Wildrye (*Elymus cinereus*)	2.5
Big Bluegrass (*Poa ampla*)	0.25
Indian Ricegrass (*Oryzopsis hymenoides*)	0.5
Sandberg Bluegrass (*Poa secunda*)	0.25
Forb Species	
Blue Flax (*Linum lewisii*)	0.25
Small Burnet (*Sanguisorba minor*)	0.5
Forage Kochia (*Kochia prostrate* var. *Immigrant*)	0.1
Palmer Penstemon (*Penstemon palmeri*)	0.1
Western Yarrow (*Achillea millefolium* var. *occidentalis*)	1.0
Shrub Species	
Fourwing Saltbush (*Atriplex canescens*)	0.75
Antelope Bitterbrush (*Purshia tridentate*)	1.0
Winterfat (*Eurotia lanata*)	0.25
Wyoming Big Sagebrush (*Artemesia tridentate wyomingensis*)	0.05

Table 2-15. Proposed Interim and Final Reclamation Seed Mixes, including Potential Alternative Reclamation Plant Species

Alternative Reclamation Plant Species	
Common Name	**Species Name**
Grass Species	
Bluebunch Wheatgrass	*Pseudoroegneria spicatum*
Thickspike Wheatgrass	*Elymus lanceolatus*
Western Wheatgrass	*Pascopyrum smithii*
Crested Wheatgrass	*Agropyron cristatum*
Slender Wheatgrass	*Elymus trachycaulus*
Sandberg Bluegrass	*Poa sandbergii*
Canby Bluegrass	*Poa canbyi*
Big Bluegrass	*Poa ampla*
Great Basin Wild Rye	*Leymus cinereus*
Indian Ricegrass	*Oryzopsis hymenoides*
Webber Ricegrass	*Oryzopsis webberi*
Idaho Fescue	*Festuca idahoensis*
Sheep Fescue	*Festuca ovina*
Green Needlegrass	*Stipa viridula*
Bottlebrush Squirreltail	*Elymus elymoides*
Sand Dropseed	*Sporobolus cryptandrus*
Alkali Sacaton	*Sporobolus airoides*
Forb Species	
Cicer Milkvetch	*Astragalus cicer*
Northern Sweetvetch	*Hedysarum boreale*
Buckwheat	*Eriogonum spp.*
Common Sainfoin	*Onobrychis viciaefolia*
Annual Ryegrass	*Lolium perenne spp. multiflorum*
Western Yarrow	*Achillea millefolium*
Blue Flax	*Linum lewisii*
Small Burnet	*Sanguisorba minor*
Gooseberry Leaf Globemallow	*Sphaeralcea grossulariaefolia*
Scarlet Globemallow	*Sphaeralcea coccinea*
Desert Globemallow	*Sphaeralcea ambigua*
Arrowleaf Balsamroot	*Balsamhoriza saggitata*
Palmer Penstemon	*Penstemon palmeri*
White Sweetclover	*Melilotus alba*
Alfalfa	*Medicago sativa*

Table 2-15. Proposed Interim and Final Reclamation Seed Mixes, including Potential Alternative Reclamation Plant Species

Alternative Reclamation Plant Species	
Common Name	**Species Name**
Shrub Species	
Wyoming Big Sagebrush	*Artemisia tridentata ssp. wyomingensis*
Big Sagebrush	*Artemisia tridentata*
Black Sagebrush	*Artemisia nova*
Antelope Bitterbrush	*Purshia tridentata*
Serviceberry	*Amelanchier (ainifolia) utahensis*
Winterfat	*Ceratoides lanata*
Chokecherry	*Prunus virginiana*
Snowbrush	*Ceanothus spp.*
Fourwing Saltbush	*Atriplex canescens*
Prostrate Kochia	*Kochia prostrate*
Rubber Rabbitbrush	*Chrysothamnus nauseosus*
Currant	*Ribes spp.*
Wood Rose	*Rosa woodsii*
Snowberry	*Symphoricarpos spp.*

Sources: SRK 2014a, BLM 2017a.

[1] Application rate is for broadcast seeding.

An approved seed mixture would be used for reseeding disturbed areas. The seed mixture and application rates presented in **Table 2-15** are subject to modification. Alternative plant species utilized in the reclamation seed mixture may be selected by HES in coordination with the BLM prior to final reclamation and reseeding. The actual seed mixture would be certified weed-free and could be modified based upon seed availability and cost. Final seed mixture, application rates, and cultivation techniques would be determined immediately prior to reseeding in order to incorporate the most recent results of reclamation in other areas of the mine, concurrent reclamation, revegetation test plots, or changes to the BLM seed mix recommendations. The BLM in coordination with HES and NDOW, may require alternative seed mixtures to be used when reseeding areas of the mule deer migration corridor to enhance the suitability of the corridor for migrating mule deer.

2.3.12.6 Noxious and Invasive Weed Best Management Practices

HES has developed a Rossi Mine Noxious and Invasive Weed Management Plan (HES 2016i) that outlines BMPs to prevent the spread of noxious and invasive weeds from previously infested areas to un-infested areas within the PoO boundary. The Rossi Mine Noxious and Invasive Weed Management Plan is available for review as an appendix to the Rossi Mine PoO. HES would implement the following BMPs during construction, operation, maintenance and reclamation:

- Equipment that is brought in to the site from previously undisturbed off-site areas would be power washed prior to entry. Equipment that is brought in from disturbed areas or new equipment would not require power washing.

- Equipment brought onto site from out of state or other projects by contractors, HES would require the contractor or company to wash the equipment prior to being brought to the Dunphy Mill site or Rossi Mine.
- Land travel would be minimized to disturbed areas, existing roads and two-tracks. Cross country travel would be permitted only when necessary (exploration, surveying) which would help minimize the potential for new noxious and invasive weed establishment.
- Halliburton would monitor identified noxious and invasive weeds and inventory them when encountered. Revegetated areas would be monitored periodically for the presence of noxious or invasive weeds.
- HES and their contractors would avoid driving through known documented noxious weed sites, including areas being treated. When these sites are driven through the equipment is washed at the wash bay immediately to stop further spread of the weeds.
- Noxious and invasive weeds would be isolated and contained to the extent possible. Selective vegetation clearing and soil stripping methods would be used to minimize the transport of noxious weed seeds, rhizomes, or roots from infested areas into areas where noxious or invasive weeds are not present. Any weed infested growth media would be hand-pulled or excavated, treated and monitored to prevent further infestation.
- Noxious and invasive weeds would be removed and disposed of in designated areas only acceptable to the BLM.
- Implementation of Halliburton's Reclamation Plan would include revegetation of disturbed areas as soon as feasibly possible and concurrent reclamation would be conducted where practical. During the reclamation phase of the proposed Project, all areas disturbed by construction would be reseeded with the approved seed mix. Seeding would occur within the proper growing season to ensure that appropriate vegetative cover/species would further reduce the establishment of noxious and invasive weeds.
- Halliburton would use certified noxious and invasive weed free materials (seed mixes, straw bales, erosion controls) where needed.
- Key Project personnel (environmental staff, management and select equipment operators) would be trained in noxious and invasive weed identifications and infestations, including proper reporting and documentation procedures.
- HES would continue to coordinate with the BLM to verify that BMPs are appropriate to minimize the spread of noxious and invasive weeds.
- Treatments used would be performed in compliance with all applicable federal, state and local weed control regulations and in consultation with the BLM weed specialist. Treatments would be performed by qualified and trained personnel. Qualification and training records of personnel conducting noxious and invasive weed treatments would be maintained on file. HES would consult with the BLM for appropriate procedures and request BLM approval for all weed treatments on public land for noxious and invasive weeds.

HES would continue to coordinate with the BLM to verify that BMPs are appropriate to minimize the spread of noxious and invasive weeds. HES would be responsible for controlling noxious weeds in the project area until the reclamation activities have been determined to be successful and released by the BLM and NDEP-BMRR. HES would follow the measures described in the Rossi Mine Reclamation Plan (SRK 2014a). This plan provides management strategies and provisions for annual monitoring and treatment of noxious weeds. The potential for invasive, non-native weeds becoming established would be reduced through the use of the approved certified weed-free seed mixture and the implementation of prompt and appropriate revegetation techniques. The best management practices of actively treating invasive, non-native weeds upon discovery would also prevent these weed species from spreading. All light vehicles and heavy equipment that have been off road (at another site) and exposed to possible noxious weed seeds must be washed before coming on to the Rossi Mine site. HES standards allow for light vehicles and heavy equipment to be washed on-site at the designated wash areas.

2.3.12.7 Reclamation of Proposed Project Facilities

The preliminary design configuration of the post-mining land forms is shown in **Figure 2-6**. Descriptions of reclamation for major facilities are provided below.

Open Pits

Open pits would be left open with the exception of the King Pit that could be partially backfilled and the Dawn Pit that would be completely backfilled as mining progresses. Pits that would not be backfilled would also not be revegetated as slope angles of pit walls and benches at closure would not be conducive to soil placement or revegetation practices due to access, safety, and logistical concerns. Areas of backfilling in the Dawn Pit and other pits would be regraded and revegetated during final reclamation. Safety berms would be placed around the surface perimeter of the open pits and warning signs would be installed according to MSHA and NDOM regulations. Some safety barriers within the open-pit area may be installed prior to closure, after mining is complete in an area. Roads providing access to the bottom of an open pit would be bermed in one or more locations to prevent vehicles from driving into the pit. An MSHA compliant pit perimeter berm would be constructed to prevent accidental access to pit walls. Although the signs would be placed approximately every 500 feet, the terrain may require signage at closer spacing so that the signs are constantly visible from one sign to the next sign. HES would be responsible for maintenance of the signs, berms and any fencing that is conducted at mine closure. Groundwater monitoring data and pit depths at the end of mining indicates a potential for pit lake formation in the King and QLC pits under the Proposed Action.

Waste Rock Disposal Facilities

WRDFs would be reclaimed at a slopes of up to 2:5H:1V to 3H:1V and would not exceed an overall slope of 2.5H:1V. This slope angle range has been demonstrated to effectively limit surface water runoff velocities and erosion. Preliminary contours of WRDF are presented in **Figure 2-6**. Reclamation of the WRDFs would be conducted concurrently with regular mine operations to the extent possible. As sections of the WRDFs reach the ultimate configuration and become inactive, the slopes would be regraded to final slope angle. The top surfaces of WRDFs would be scarified. Approximately and average of six inches of growth media cover would be placed on the WRDF's surface; however, depths of growth media may vary over the WRDF. Growth media cover depth may vary based upon the results of revegetation test plots (Section 2.3.12.4) and in coordination with the BLM and NDEP-BMRR. Final seed mixes presented in **Table 2-15** would be applied following cover placement. Stormwater controls would be constructed around the perimeter of WRDFs and retained as post-mining features.

Jig Plant and other Support Facilities

The jig plant would be disassembled and removed. The concrete jig plant foundation would be demolished in place and buried with a minimum of five feet of material and covered with six inches of growth media. Other jig plant debris would be removed off-site to an approved solid waste landfill.

Support buildings and structures would be dismantled as required by the post-mining land use objectives, and materials would be salvaged, and transported to a permitted landfill located off-site. Concrete foundations and slabs would be broken up or otherwise arranged to prevent ponding where possible and buried in place under a minimum of 5 feet of cover. Where foundations are left intact, they would be buried under a minimum of 10 feet of cover. The disturbed areas would be regraded and revegetated after demolition, salvage operations, and cover placement was completed.

Fuels, lubricants, and other petroleum products would be removed from structures and containment areas for re-use or transported to an approved disposal facility. Remaining reagents and explosives would be removed for use at other mines or disposed of at a licensed off-site facility. The sanitary domestic waste holding tank would be closed in accordance with state and local regulations. Above-ground electrical infrastructure would be removed from the site, the pole holes would be backfilled, and below-ground electrical lines would be abandoned and buried in place. When possible, the wires would be salvaged. Underground pipes would be capped and abandoned in place. Above ground pipes would be removed from the site and disposed of properly. Truck scales would be removed from the site. HDPE liners and

associated petroleum-contaminated soil would be removed and disposed of at an appropriate facility. Unnecessary signs would be removed for re-use or disposal off-site.

Jig Plant Ponds

During reclamation the jig pond embankments would be contoured to blend with the natural terrain to prevent pooling of meteoric water. Jig pond areas would be scarified and seeded. Water conservation infrastructure would be treated in accordance with local, state and federal regulations. The stock pond would be not be retained as a post-reclamation feature and would be reclaimed to match the surrounding natural topography. The watering trough for cattle would be removed, cleaned up and materials disposed of properly in an approved facility.

Roads

At the completion of mining, exploration roads, secondary roads, and haul roads not located in pits would be reclaimed. Public access to areas north and west of the site would be maintained through the use of the Boulder Valley Road, the Antelope-Boulder Connector Road, and the rerouted public access road. Road cuts and fills would be contoured to approximate the pre-mining topography. Roads would be ripped, reshaped, and growth media placed prior to the application of the final seed mix. Stormwater controls may be retained as post-mining features if no longer needed. Culverts would be removed from mining roads as applicable, and drainage crossings would be reshaped to approximate the original drainage. Riprap would be used if drainage stabilization is required to prevent scouring. Some roads would be retained to provide public access to areas north and west of the mine area. Maintenance of the public access roads through the Rossi Mine area would probably resort back to the landowner. Exploration roads, pads, sumps and trenches would be backfilled or regraded and recontoured to blend with the surrounding terrain and then seeded.

Drill Hole Plugging and Water Well Abandonment

Mineral exploration and development drill holes as well as monitoring and production wells subject to NDWR regulations would be abandoned in accordance with applicable rules and regulations (NAC 534.425 through 534.428). Boreholes would be sealed to prevent cross-contamination between aquifers, and the required shallow seal would be placed to prevent contamination by surface access.

The water production wells would be plugged and abandoned in accordance with applicable requirements. Monitoring wells would be maintained until HES is released from post-mining groundwater monitoring requirements by the NDEP-BMRR and BLM. These wells then would be plugged and abandoned in accordance with the applicable requirements.

Surface Facilities or Roads Not Subject to Reclamation

Roads and some buildings on private land may remain, as consistent with post-mining land use objectives. Stormwater controls and culverts located on public roads would remain as post-mining features.

Surface Water Best Management Practices and Erosion Controls

HES would utilize BMPs to minimize sediment transport during closure and reclamation. BMPs could include, but are not limited to, placement of straw bales, grass wattles, silt fences, or structures to control sediment. Stormwater runoff would be diverted around pits and WRDFs and returned to natural drainages. Stormwater diversions and basins would be designed to the 100-year, 24-hour storm. Culverts would be retained where post-mining roads cross natural drainages only if necessary. Crossings would be evaluated, culverts removed and low water crossings would be constructed.

2.3.12.8 Measures to be taken During Extended Periods of Non-Operation

In the event that continuous, full-scale production is interrupted due to economic considerations or unforeseen circumstances, interim reclamation may be initiated. Interim reclamation would include the following actions:

- Power transmission and distribution lines – the power transmission line, distribution lines, and system control panels would be inspected regularly and maintained as necessary;
- Roads – the main access road would be maintained as necessary;
- Open Pit – berms or fences would be placed to help restrict access to bench face areas;
- Erosion Control Measures – erosion control measures and BMPs would be regularly inspected and maintained; and
- Buildings – buildings, equipment, and support facilities would be protected from public access and maintained as necessary.

Per NAC 519A.320 (2), HES would notify the BLM and NDEP-BMRR in writing within 90 days after a production suspension that is anticipated to last longer than 120 days. HES would identify the nature and reason for the suspension, the duration of the suspension, and anticipated timing of resumption of mining or the closure of the site.

2.3.12.9 Post-closure Monitoring and Maintenance

Following mine closure and reclamation, fence and sign maintenance, site inspections, and storm water control facility maintenance would continue for the period of reclamation responsibility. Monitoring for noxious weeds and revegetation success would be conducted until the revegetation standards have been met as determined by the BLM and NDEP-BMRR.

Post-closure groundwater quality would be monitored according to the requirements established by NDEP under the approved Rossi Mine Water Pollution Control Permit. The final closure plan submitted at least 2 years prior to the anticipated closure date would serve as the basis of the post-closure monitoring plan. Post-closure monitoring by NDEP could continue up to 30 years following completion of processing based on current regulations. The duration of the BLM post-closure monitoring would depend on the project's issues, if any exist, the specifics of the final closure plan and its implementation. The current 43 CFR 3809 regulations do not have timeframe limitations for closure and reclamation. A plan of operations does not expire or end until the closure and reclamation activities have been satisfactorily and successfully completed as determined by the BLM. A plan of operations may be revoked by the BLM if sufficient cause is identified.

2.3.13 Applicant Committed Environmental Protection Measures

Under the Proposed Action, HES has committed to implementing the Applicant Committed Environmental Protection Measures listed in **Table 2-16** to minimize impacts to resources and to prevent unnecessary and undue degradation of the natural environment. These measures would be implemented during the design, construction, operation, closure, and reclamation phases of the Proposed Action. Non-regulations are voluntary environmental protection measures that HES has committed to conduct as part of the Proposed Action for this project. These actions become a part of the Proposed Action and are enforceable as a part of the Proposed Action under the appropriate authority. If measures listed in **Table 2-16** are required per a regulation then these actions would be enforced by the specific regulation.

Table 2-16. Design Features and Applicant Committed Environmental Protection Measures

Critical Element/Resource	Potential Concerns	Design Feature/Applicant Committed Environmental Protection Measure
Air Quality	• Fugitive dust from road traffic • Fugitive dust from mining, processing, and material handling operations • Exhaust emissions	HES, in compliance with the NDEP-BAPC Surface Disturbance Permit which is part of Air Quality Operating Permit AP3295-2080, would undertake road maintenance activities to reduce fugitive dust emissions. Roads within the project area would be watered, graveled, or chemically treated with magnesium chloride to reduce fugitive dust emissions, as needed. Vehicle speeds would be reduced in areas of disturbance to minimize the potential for fugitive dust emissions, to protect wildlife and livestock, and to maintain operational safety. Project vehicles would be maintained on a regular basis. HES would use wet drilling methods to reduce the potential for fugitive dust emissions during blasthole drilling and exploration activities. Stationary emission sources would be operated in accordance with NDEP/BAPC Air Quality Operating Permit AP3295-2080. Water would be applied as needed for fugitive dust control. Dust emissions from the crushing operation are suppressed through water sprays.
Water Quality	• Impacts to groundwater • Impacts to surface water • Sedimentation • Stormwater run-off	HES has a SWPPP under the Nevada General Industrial Stormwater Permit (NVR05000), and a SPCCP in place to manage hydrocarbons and address potential releases. The plans are included in Appendix F and Appendix G respectively of the PoO. Materials and equipment necessary for spill cleanup would be kept on site. Fuels and lubricants would be handled in a safe and structured fashion. If an accidental spill should occur, it would be cleaned up immediately. Materials used for cleanup would be disposed of at an appropriate facility. Accepted engineering practices/BMPs for sediment control would be employed to minimize sedimentation of disturbed areas. Sediment control structures may include, but are not limited to, fabric and/or certified weed-free straw bale filter fences, siltation or filter berms, mud sumps, and down gradient drainage channels in order to prevent unnecessary or undue degradation to the environment. In order to control erosion from roads and drill sites, and from the unlikely event of drill cuttings being released, certified weed-free straw bales and silt fences would be placed in drainages to capture sediment, where required. Selected BMPs, such as water bars and drainage stabilization rip-rap, may be left in place after reclamation. Roads would be designed to the minimum standards needed to accommodate the intended safe use and to maintain surface resource protection. Road construction would be conducted in such a manner as to minimize cuts and fills, including limiting road construction on steep slopes, where possible. Access across drainages, seeps, and springs would be avoided where possible. Drainage structures would be constructed or installed where necessary to prevent or minimize erosion and sedimentation. Drainage structures may consist of, but not be limited to, water bars, borrow ditches, contour furrows, and culverts sized to handle maximum seasonal water flows. Exploration drilling sumps for drill water, fluids, and cuttings would be excavated within the limits of or adjacent to the drill site. Final sump dimensions would be designed to meet the estimated required capacity of drill fluids and cuttings. Exploration activities would be kept to a minimum distance of 400 feet from drainages that are actively flowing as directed in the BLM Elko District RMP. HES would plug all drill holes in accordance with NRS 534.4371 as administered by NDWR, State Engineers Office to protect groundwater resources. Surface and ground water monitoring would be conducted in accordance with the approved water pollution control permit. Well pumping reports would be submitted monthly to the NDWR in accordance with water appropriations permits.

Table 2-16. Design Features and Applicant Committed Environmental Protection Measures

Critical Element/Resource	Potential Concerns	Design Feature/Applicant Committed Environmental Protection Measure
Soil Resources	• Loss of soil due to erosion resulting from wind and water	A soil loss equation analysis has been performed for the site and is included in the Stormwater Control Design Report in Appendix E of the PoO. The analysis shows that the WRDFs have the potential for erosion and require the implementation of BMPs to control erosion and sediment transport. Erosion and runoff control measures in disturbed areas may include: water bars, diversion ditches, sumps, interim seeding of growth media stockpiles and select berms, certified weed-free straw bales, silt fences, and rock and gravel cover. Sediment and erosion control measures would be inspected periodically and repairs performed as needed. Disturbed areas would be regraded, and concurrent reclamation may occur where no additional disturbance is planned. Facilities would be monitored following spring snowmelt and intense rain events in accordance with the SWPPP to ensure that drainage and sediment control measures are effective and operating properly. Quarterly inspections and event monitoring would be conducted in accordance with the SWPPP to verify that stormwater controls are functioning as designed. If inspections indicate controls are not functioning properly, controls would be modified in accordance with the SWPPP. Road construction and road-related storm water controls are governed by the provisions of the SWPPP and the Nevada General Industrial Stormwater Permit, NVR050000. Roads would be designed to incorporate the minimum standards for their intended use, maintain surface resource protection, and incorporate MSHA standards. Where feasible, road construction would be designed to minimize cuts and fills, including limiting road construction on steep slopes.
Wildlife, Migratory Birds, and Sensitive Species	• Nesting migratory birds, including raptors	HES would attempt to conduct surface disturbance activities outside the avian breeding season to prevent the destruction of active bird nests or of young birds during the avian breeding season for sagebrush-grassland habitats (March 1 to July 31). If it becomes necessary to clear land during the breeding season, a survey for active nests within areas to be cleared would be conducted by a qualified biologist. Disturbance must occur within 14 days of the completion of the survey. If disturbance does not occur within 14 days, a new survey would be required. If active nests are located, a protective buffer would be established. The size of the buffer and its duration would be based on the species and would be approved by BLM biologists. Bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 USC 668-688d). This definition also covers impacts that may result due to human activities to or around a nesting site during times when eagles are not present, if or when the eagles return, the alterations or activities interrupt their normal breeding, feeding, sheltering, or cause death, or nest abandonment (USFWS 2012). Surveys for raptors and raptor nests were performed in and within a one-mile buffer of the project area. Surveys for Golden Eagles and nesting Golden Eagles were performed in and within a ten mile buffer of the project area. Five species of raptors were observed in or near the project area. Golden Eagle (*Aquila chrysaetos*), Northern Harrier (*Circus cyaneus*), Prairie Falcon (*Falco mexicanus*), Red-tailed Hawk (*Buteo jamaicensis*), and Turkey Vulture (*Cathartes aura*) were all recorded flying in or near the project area (SRK 2013b). HES's proposed construction, operation, and reclamation procedures would incorporate measures to protect eagles. Surveys would be conducted prior to ground disturbance in the breeding and nesting seasons (March 1 to July 31) to determine the presence or absence of eagles as well as other raptor

Table 2-16. Design Features and Applicant Committed Environmental Protection Measures

Critical Element/Resource	Potential Concerns	Design Feature/Applicant Committed Environmental Protection Measure
		species. If nesting or brooding eagles are determined to be present, HES would avoid the area using a buffer zone developed in coordination with the BLM and NDOW. To comply with regulations and avoid or minimize impacts to these species, HES has prepared a Bird and Bat Conservation Strategy for the site.
Wildlife	• Migrating mule deer	The construction of the WRDFs associated with the QLC would be sequenced to provide mule deer access to the previously identified migration corridor for the greatest possible time (BLM 2012a). The following strategy would be used to facilitate mule deer migration. Exploration drilling around the QLC Pit would determine if additional barite resources can be economically extracted by expanding the proposed pit. If exploration drilling expands the pit, portions of the QLC North and QLC East WRDFs would be regraded, providing approximately a 2,000-foot-wide corridor before Dawn WRDF construction begins. HES would work with the BLM to identify, avoid, and mitigate potential impacts. HES would immediately report all project related wildlife mortalities to NDOW.
Livestock and Range Allotments	• Loss of forage	HES would protect existing fences, gates, livestock ponds, and other range improvements within the project area. Gates would be closed and/or locked as appropriate.
Cultural Resources	• Protection of cultural resources	HES would conduct activities in accordance with all applicable state and federal regulations and the MOA between the BLM, SHPO, and HES. The MOA would be amended to include the entire Project area. For areas that previously have been surveyed at the Class III level, the BLM would determine which cultural sites need to be monitored and establish an exclusion zone around each site eligible for the National Register of Historic Places (NRHP). Sites that cannot be avoided through the redesign of mine features would be preserved through a BLM and SHPO approved treatment plan for data recovery. Class III surveys, in accordance with Section 106 of the Archeological Resources Protection Act, have been conducted over the entire project area. Treatment of some eligible sites in areas of authorized disturbance has been conducted per BLM requirements, in accordance with the MOA. Documented sites would be protected from surface-disturbing activities by an exclusion zone determined by a BLM archaeologist until the BLM assesses whether the site is eligible for listing on the NRHP. If the BLM determines, in consultation with SHPO, that such a site is or may be eligible for the National Register, HES would not conduct any surface-disturbing activities within the exclusion zone without further authorization from the BLM, which may require further environmental and/or cultural analyses, treatment or mitigation. If the site is determined not to be eligible, or the BLM determines that existing cultural surveys are sufficient to conclude that no eligible sites exist, HES may conduct surface-disturbing activities upon notification by the BLM. If HES discovers previously unknown cultural resources while undertaking exploration activities, HES would immediately cease any surface-disturbing activity within 100 meters/330 feet of the discovery and notify the BLM. If the BLM determines, in consultation with SHPO, that the site is or may be eligible for the NRHP, a BLM archaeologist would determine an exclusion zone adequate to protect the resource. HES would not conduct any surface-disturbing activities within this exclusion zone without further authorization from the BLM, which may require further environmental and/or cultural analyses. If the site is determined not to be eligible, HES may resume surface-disturbing activities upon notification by the BLM. HES employees and contractors would avoid disturbing, altering, or destroying any remains or any

Table 2-16. Design Features and Applicant Committed Environmental Protection Measures

Critical Element/Resource	Potential Concerns	Design Feature/Applicant Committed Environmental Protection Measure
		historical or archaeological site, structure, building or object on federal land. If activities uncover human remains, HES would immediately cease all surface-disturbing activities within 100 meters/330 feet of the discovery and notify the BLM and county law enforcement so that the BLM and/or law enforcement can ensure compliance with all applicable laws regarding such discovery.
Paleontological Resources	• Impacts to scientifically important paleontological resources	If HES discovers a vertebrate fossil deposit or BLM-designated scientifically significant invertebrate fossil deposit during surface-disturbing activities, HES would immediately cease further activities that may affect the deposit and notify the BLM so that the BLM may evaluate the discovery. HES would follow fossil mitigation measures required by the BLM.
Survey Monuments	• Impacts to survey monuments	Survey monuments, witness corners, and/or reference monuments would be protected to the extent economically and technically feasible. Should moving these features be required, HES would ensure that a licensed Professional Land Surveyor oversee and execute the relocation in a manner consistent with applicable laws. The BLM would be notified in writing prior to the moving of any such survey monument.
Employee Training	• Environmental awareness	Employees, contractors, and other related personnel would receive training regarding environmental responsibilities required by federal and state laws and the PoO.

Source: SRK 2014a.

2.4 Alternatives to the Proposed Action

The BLM NEPA Handbook (H-1790-1) requires a range of reasonable alternatives to the Proposed Action to be identified and considered for approval. Reasonable alternatives include those that are practical or feasible from a technical and economic standpoint, including the No Action Alternative. The No Action Alternative reflects a continuation of previous PoO approvals and modifications and current management practices.

During the scoping process, multiple resource related topics were discussed concerning the Proposed Action submitted to the BLM by HES in the PoO (SRK 2014a). Resource concerns raised during scoping focused upon the potential for the proposed Dawn WRDF, in conjunction with the previously approved Arturo Mine development, to constrain an important mule deer migration corridor used by the Area 6 mule deer herd to move to and from important seasonal ranges within the vicinity of the Rossi Mine. In response to this concern, HES has revised the design and sequencing of the Dawn WRDF and other facilities footprints to conserve mule deer migratory habitat. These revised designs are discussed under the Reconfiguration Alternative.

Other resource topics discussed during the scoping process included livestock grazing, public access and safety, Native American traditional uses, and cultural resources. Each potential resource was considered and potential alternatives were considered and evaluated based upon the ability to satisfy the purpose and need of the project, potential environmental and social benefits in comparison to the Proposed Action, and the economic and technical feasibility of implementation. The following section describes the potential alternatives and the rationale for carrying them forward for detailed analysis or eliminating them from further analysis.

2.4.1 No Action Alternative

The No Action Alternative is to continue mining and processing operations at the existing Rossi Mine under the terms of current permits and approvals as authorized by the BLM and the State of Nevada. The No Action Alternative boundary would not expand (**Figure 2-1**) and currently authorized project activities are detailed in Section 2.2, Existing Rossi Mine Operations. The No Action Alternative would include completion of the reclamation and closure of the existing and authorized mine disturbance and reclamation of the surface exploration activities within the project area under the terms of current permits and approvals. See **Table 2-1** for a list of existing BLM NEPA documents applicable to the Rossi Mine. **Table 2-3** presents information on previously authorized surface disturbance acreages by facility.

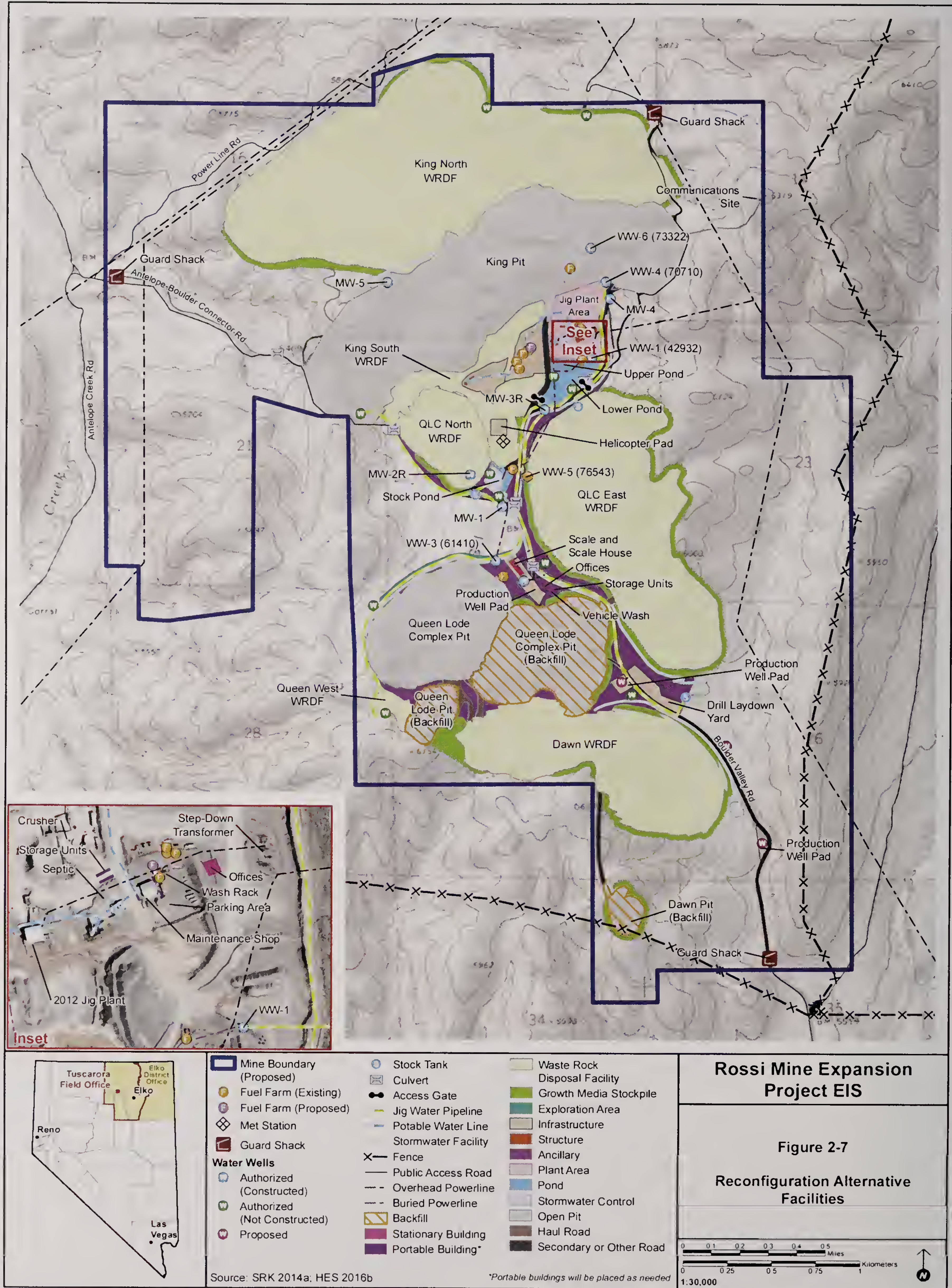
2.4.2 Reconfiguration Alternative

The description of the Reconfiguration Alternative is focused on those aspects of the alternative that differ from the previously described Proposed Action. Facilities under the Reconfiguration Alternative would be located as presented in **Figure 2-7**. Additionally, all design features and Applicant Committed Environmental Protection Measures described for the Proposed Action would, as applicable, be required for the Reconfiguration Alternative.

The Reconfiguration Alternative is comprised of the same facilities and undertakings as described for the Proposed Action in Section 2.3, but some WRDF facilities and undertakings have been modified for the Reconfiguration Alternative to maintain a minimum 2000-foot-wide undisturbed corridor for mule deer migration between the proposed Dawn WRDF and the Arturo Mine facilities to the south as shown in **Figure 2-8**. Operational boundaries for the Arturo Project are displayed as the existing and authorized fences in **Figure 2-8**. HES and Barrick would actively coordinate with the BLM and NDOW to monitor the status of the mule deer migration corridor to ensure that any unnecessary impediments to migration are identified and removed prior to and during seasonal migration periods. Detailed analysis of mule deer migration is presented in Section 3.17, Wildlife and Aquatic Biological Resources. Sequencing of mine facility construction and mining activities would be modified as necessary to allow maximize mining efficiency and to allow for continued mule deer migration through the project area.

The most notable modifications to the Proposed Action that result in the Reconfiguration Alternative include the following:

- Reduced footprint of the Dawn WRDF;
- Complete pit backfilling of the eastern portion of the QLC pit (formerly the QLEE and Sumner pits) with waste rock material; and
- Modifications to the QLC North and East WRDFs.



Rossi Mine Expansion Project EIS

Figure 2-7

Reconfiguration Alternative Facilities

10/10/2017

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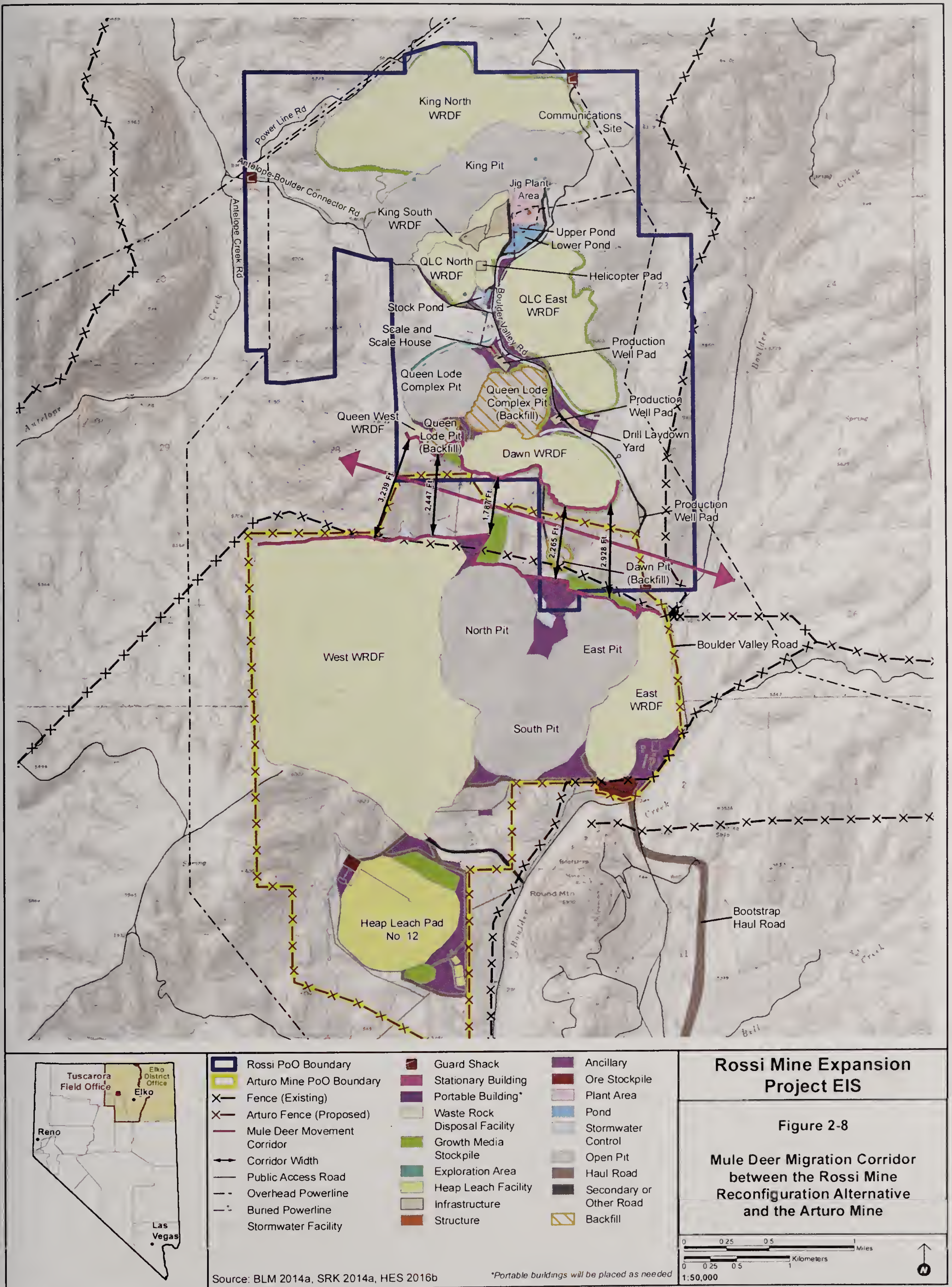

Rossi Mine Expansion Project EIS

Figure 2-8

Mule Deer Migration Corridor between the Rossi Mine Reconfiguration Alternative and the Arturo Mine

11/10/2017

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notice.

2.4.2.1 Surface Ownership and Land Status

The Rossi Mine PoO area under the Reconfiguration Alternative is the same as the Proposed Action and includes approximately 3,731 acres. **Table 2-17** presents the total anticipated surface disturbance acreage under the Reconfiguration Alternative, including the acres of previously authorized facilities that would be developed under the Reconfiguration Alternative. **Table 2-18** summarizes the surface disturbance under the Reconfiguration Alternative and compares this with the Proposed Action surface disturbance for the major mine categories/facilities. The Reconfiguration Alternative would result in a reduction of 151 acres of new surface disturbance compared with the Proposed Action.

2.4.2.2 Schedule and Workforce

The Reconfiguration Alternative would have an 8-year mine life similar to the Proposed Action. The anticipated workforce for the Reconfiguration Alternative would remain the same as under the Proposed Action. A summary of the proposed mining, processing, and reclamation schedule under the Reconfiguration Alternative is provided in **Table 2-19.**

Table 2-17. Authorized and Reconfiguration Alternative Disturbance Acreages

Facility	Reconfiguration Alternative						Total Disturbance		
	Authorized Disturbance[3]			New Disturbance					
	Public (acres)	*Private (acres)*	*Total (acres)*	*Public (acres)*	*Private (acres)*	*Total (acres)*	*Public (acres)*	*Private (acres)*	*Total (acres)*
Pits									
King Pit	87.0	165.4	252.4	58.1	-	58.1	145.1	165.4	310.5
Queen Lode Pit[5]	-	13.9	13.9	0.1	2.1	2.2	0.1	16.0	16.1
Queen Lode Complex[1] (QLC)	50.1	7.5	57.6	134.0	1.7	135.7	184.1	9.2	193.3
Dawn Pit[6]	-	-	-	10.5	-	10.5	10.5	-	10.5
Pit Subtotal	**137.1**	**186.8**	**323.9**	**202.7**	**3.8**	**206.5**	**339.8**	**190.6**	**530.4**
Waste Rock Disposal Facilities (WRDF)/Growth Media Stockpiles									
King North WRDF	286.3	-	286.3	125.3	-	125.3	411.6	-	411.6
King South WRDF	70.5	5.9	76.4	0.5	-	0.5	71.0	5.9	76.9
Queen West WRDF	3.8	3.3	7.1	-	-	-	3.8	3.3	7.1
Queen Lode WRDF	-	-	-	-	-	-	-	-	-
QLC East WRDF	0.9	-	0.9	236.9	-	236.9	237.8	-	237.8
QLC North WRDF	31.9	-	31.9	16.9	-	16.9	48.8	-	48.8
Dawn WRDF	36.5	-	36.5	130.2	-	130.2	166.7	-	166.7
Growth Media Stockpiles	5.6	0.9	6.5	85.1	1.8	86.9	90.7	2.7	93.4
WRDF/Stockpile Subtotal	**435.5**	**10.1**	**445.6**	**594.9**	**1.8**	**596.7**	**1,030.4**	**11.9**	**1,042.3**
Roads									
Haul Roads	2.3	1.5	3.8	0.4	0.7	1.1	2.7	2.2	4.9
Secondary Roads	7.9	-	7.9	45.5	-	45.5	53.4	-	53.4
Roads Subtotal	**10.2**	**1.5**	**11.7**	**45.9**	**0.7**	**46.6**	**56.1**	**2.2**	**58.3**

Table 2-17. Authorized and Reconfiguration Alternative Disturbance Acreages

Facility	Reconfiguration Alternative						Total Disturbance		
	Authorized Disturbance[3]			New Disturbance					
	Public (acres)	*Private (acres)*	*Total (acres)*	*Public (acres)*	*Private (acres)*	*Total (acres)*	*Public (acres)*	*Private (acres)*	*Total (acres)*
Exploration Activities									
Exploration Activities	56.1	-	56.1	73.8	-	73.8	129.9	-	129.9
Monitoring Wells	1.5	0.2	1.7	0.5	-	0.5	2.0	0.2	2.2
Exploration Subtotal	**57.6**	**0.2**	**57.8**	**74.3**	**-**	**74.3**	**131.9**	**0.2**	**132.1**
Operations									
Ponds	17.6	-	17.6	0.7	-	0.7	18.3	-	18.3
Jig Plant/Processing Area	28.1	-	28.1	0.1	-	0.1	28.2	-	28.2
Stormwater Controls	0.1	-	0.1	17.7	-	17.7	17.8	-	17.8
Other Support Facilities[2]	7.9	3.4	11.3	73.2	-	73.2	81.1	3.4	84.5
Operations Subtotal	**53.7**	**3.4**	**57.1**	**91.7**	**-**	**91.7**	**145.4**	**3.4**	**148.8**
Total[4]	**694**	**202**	**896**	**1,010**	**6**	**1,016**	**1,704**	**208**	**1,912**

Sources: SRK 2014a; HES 2016b.

[1] Formerly the Queen Lode Eastern Extension (QLEE). A total of 91 acres of the eastern portion of the QLC Pit would be backfilled under the Reconfiguration Alternative.
[2] Includes fuel storage, solid/petrol waste containers, vehicle wash, maintenance pad, buried power distribution lines, helicopter pad, fire break and communication tower.
[3] Acreages of authorized facilities are those that would be included in the Reconfiguration Alternative, if approved. These acreages vary slightly from those reported in **Table 2-3**, as the acreages of selected previously authorized facilities would be reallocated to those identified under the Reconfiguration Alternative.
[4] Totals have been rounded to the nearest integer and may vary due to rounding.
[5] The 16.1 acre Queen Lode Pit would be completely backfilled.
[6] The 10.5 acre Dawn Pit under the Reconfiguration Alternative would be completely backfilled.

Table 2-18. Total Surface Disturbance Comparison for the Proposed Action and Reconfiguration Alternatives

Facility	Proposed Action			Reconfiguration Alternative		
	Public (acres)	*Private (acres)*	*Combined (acres)*	*Public (acres)*	*Private (acres)*	*Combined (acres)*
Pits						
King Pit	145.1	165.4	310.5	145.1	165.4	310.5
Queen Lode Pit[4]	0.1	16.0	16.1	0.1	16.0	16.1
Queen Lode Complex[1] (QLC)	184.1	9.2	193.3	184.1	9.2	193.3
Dawn Pit[5]	9.0	0	9.0	10.5	0	10.5
Pit Subtotal	**338.3**	**190.6**	**528.9**	**339.8**	**190.6**	**530.4**
Waste Rock Disposal Facilities (WRDF)/Growth Media Stockpiles						
King North WRDF	411.6	0	411.6	411.6	0	411.6
King South WRDF	102.5	5.9	108.4	71.0	5.9	76.9
Queen West WRDF	3.8	3.3	7.1	3.8	3.3	7.1
Queen Lode WRDF	33.4	0.2	33.6	0	0	0
QLC East WRDF	197.6	0	197.6	237.8	0	237.8
QLC North WRDF	128.5	0	128.5	48.8	0	48.8
Dawn WRDF	182.3	0	182.3	166.7	0	166.7
Growth Media Stockpiles	95.1	2.3	97.4	90.7	2.7	93.4
WRDF/Stockpile Subtotal	**1,154.8**	**11.7**	**1,166.5**	**1,030.4**	**11.9**	**1,042.3**
Roads						
Haul Roads	2.5	0.4	2.9	2.7	2.2	4.9
Secondary Roads	47.8	0	47.8	53.4	0	53.4
Roads Subtotal	**50.3**	**0.4**	**50.7**	**56.1**	**2.2**	**58.3**
Exploration Activities						
Exploration Activities	123.0	0	123.0	129.9	0	129.9
Monitoring Wells	2.0	0.2	2.2	2.0	0.2	2.2
Exploration Subtotal	**125.0**	**0.2**	**125.2**	**131.9**	**0.2**	**132.1**
Operations						
Ponds	18.3	0.7	19.0	18.3	0	18.3
Jig Plant/Processing Area	28.1	0.1	28.2	28.2	0	28.2
Stormwater Controls	19.1	0	19.1	17.8	0	17.8
Other Support Facilities[2]	120.1	5.5	125.6	81.1	3.4	84.5
Operations Subtotal	**185.6**	**6.3**	**191.9**	**145.4**	**3.4**	**148.8**
Total[3]	**1,854**	**209**	**2,063**	**1,704**	**208**	**1,912**

[1] Formerly the Queen Lode Eastern Extension (QLEE). A total of 91 acres of the eastern portion of the QLC Pit would be backfilled under the Reconfiguration Alternative; no backfilling is proposed for the QLC Pit under the Proposed Action.
[2] Includes fuel storage, solid/petrol waste containers, vehicle wash, maintenance pad, power lines, helicopter pad, and communication tower.
[3] Totals have been rounded to the nearest integer.
[4] The 16.1 acre Queen Lode Pit would be completely backfilled.
[5] The Dawn Pit would be completely backfilled under the Proposed Action (9.0 acres) and Reconfiguration Alternative (10.5 acres).

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Table 2-19. Conceptual Schedule for Mining, Processing, and Reclamation under the Reconfiguration Alternative

Activity	Year																
	1[1]	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*
Pits																	
King Pit																	
Pit Excavation																	
Post-mining Berm Construction																	
Queen Lode Pit																	
Pit Excavation																	
Queen Lode Complex																	
Salvage Growth Media																	
Pit Excavation																	
Pit Backfill																	
Recontour/Place Growth Media/Seed																	
Monitor Revegetation																	
Post-mining Berm Construction																	
Dawn Pit																	
Salvage Growth Media																	
Pit Excavation																	
Pit Backfill																	
Recontour/Place Growth Media/Seed																	
Monitor Revegetation																	
Waste Rock Disposal Facilities (WRDF)																	
King North WRDF																	
WRDF Operation																	
Recontour/Place Growth Media/Seed																	
Monitor Revegetation																	
King South WRDF																	
WRDF Operation																	
Recontour/Place Growth Media/Seed																	
Monitor Revegetation																	
Queen Lode Pit backfill																	
WRDF Operation																	
Recontour/Place Growth Media/Seed																	
Monitor Revegetation																	
Queen West WRDF																	
WRDF Operation																	
Recontour/Place Growth Media/Seed																	
Monitor Revegetation																	

Table 2-19. Conceptual Schedule for Mining, Processing, and Reclamation under the Reconfiguration Alternative

Activity	Year																
	1[1]	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
QLC North WRDF																	
Salvage Growth Media																	
WRDF Construction																	
Recontour/Place Growth Media/Seed																	
Monitor Revegetation																	
QLC East WRDF																	
Salvage Growth Media																	
WRDF Construction																	
Recontour/Place Growth Media/Seed																	
Monitor Revegetation																	
Dawn WRDF																	
Salvage Growth Media																	
WRDF Construction																	
Recontour/Place Growth Media/Seed																	
Monitor Revegetation																	
Jig and Operations Areas																	
Buildings and Facilities																	
Operate Jig Plants																	
Demolition or Removal of Buildings, Facilities, and Supplies																	
Regrade Yards/Place Growth Media/Seed																	
Monitor Revegetation																	
Ponds																	
Operate and Modernize Ponds																	
Evaporate Water and Consolidate																	
Regrade/Place Growth Media/Seed																	
Monitor Revegetation																	
HDPE-lined Facilities																	
Operate and Modernize Facilities																	
Remove Liners and Dispose																	
Sample/Analyze Underlying Soils																	
Regrade Yards/Place Growth Media/Seed																	
Monitor Revegetation																	

Table 2-19. Conceptual Schedule for Mining, Processing, and Reclamation under the Reconfiguration Alternative

Activity	Year																
	1[1]	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Infrastructure																	
Jig Water Corridor Pipeline																	
Operate Pipeline																	
Decommission Pipeline																	
Scarify and Seed																	
Monitor Revegetation																	
Electrical Power Service																	
Construct and Operate Electrical Service																	
Decommission Service																	
Scarify and Seed																	
Monitor Revegetation																	
Stormwater Controls																	
Construct and Operate																	
Monitor Operation																	
Roads																	
Haul Roads																	
Construct and Operate Haul Roads																	
Regrade Roads/Place Growth Media/Seed																	
Monitor Revegetation																	
Secondary Roads																	
Construct and Operate Secondary Roads																	
Regrade Roads/Place Growth Media/Seed																	
Monitor Revegetation																	
Public Access Roads																	
Construct Public Access Roads																	
Wells																	
Lysimeter Construction and Operation																	
Lysimeter Abandonment																	
Monitor Well Operation																	
Monitor Well Abandonment																	
Production Well Construction and Operation																	
Production Well Abandonment																	
Remove Well House or Pad																	

Table 2-19. Conceptual Schedule for Mining, Processing, and Reclamation under the Reconfiguration Alternative

Activity	Year																
	1[1]	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Exploration																	
Construct Exploration Roads, Pads, and Drilling																	
Hole Abandonment																	
Regrade Yards/Place Growth Media/Seed																	
Monitor Revegetation																	

Source: HES 2015e.

Denotes an operations activity

Denotes a reclamation activity

[1] Approximate start date of 2018.

2.4.2.3 Open Pits

Design parameters for open pits under the Reconfiguration Alternative would be similar to the Proposed Action with the following exception. The sequencing of the construction would be modified to allow for the proposed Dawn Pit to be mined and completely backfilled to the original topography in year 2 of the project. Once backfilling of the Dawn Pit is completed, reclamation of this facility would begin immediately in order to reduce the duration of surface disturbance at this location. It is anticipated that reclamation activities including backfill re-contouring, placement and grading of growth media cover, and reseeding would be completed by the end of project year 2.

The QLC Pit and WRDFs are designed and would be constructed to conform to the recommendations presented in the Pit Slope Stability report for the proposed Rossi Mine Expansion (Sacrison Engineering 2015). A summary of open pit design parameters is presented in **Table 2-20**.

Table 2-20. Reconfiguration Alternative Open Pit Design Parameters

Pit	Width (feet)	Length (feet)	Depth (feet bgs)	Pit Bottom Elevation (feet amsl)
King Pit	2,063	7,509	500	5,325
Queen Lode Complex (QLC)	2,231	4,389	785	5,285
Dawn Pit	659	919	215	5,800

Source: HES 2016c.

2.4.2.4 Waste Rock Disposal Facilities

Details of the anticipated volumes of waste rock are provided in **Table 2-21**.

Table 2-21. King North, QLC, and Dawn WRDF Design Parameters under the Reconfiguration Alternative

Waste Rock Disposal Facility	Width (feet)	Length (feet)	Capacity (MT)	Crest Height (feet)	Crest Elevation (feet amsl)
King North	3,392	8,386	46.0	260	5,840
QLC East	2,727	5,424	54.7	335	6,000
QLC North	1,379	2,007	9.5	175	5,750
Dawn	1,986	5,079	40.0	360	6,000

Source: HES 2016c.

2.4.2.5 QLC Area Pits and WRDFs Sequencing for Years 1–8

The general development of the mine facilities in the vicinity of the QLC area pits and WRDFs over the 8-year mine life is summarized in this section and presented in **Figure 2-9** through **Figure 2-12**. The pit and WRDFs construction sequence is described in 2-year intervals with corresponding figures.

Years 1 and 2

The primary activities during years 1 and 2 would be moving waste rock in the eastern areas of the QLC pit (formerly the QLEE and Sumner pits) to nearby WRDFs as well as mining out the Dawn Pit to the south of the Dawn WRDF as presented in **Figure 2-9**.

- In years 1 and 2, the Dawn Pit would be mined out and completely backfilled (1.2 million cubic yards), recontoured, and seeded for reclamation (**Figure 2-9** shows backfilled Dawn Pit);
- There would be a smaller amount of waste removal in the western areas of the QLC Pit;
- The existing county road would be re-routed through the haul road;
- Approximately 17.7 million cubic yards of in-situ material would be removed from the pits;
- A total of 26.5 million cubic yards of waste rock would be placed in the following WRDFs:
  - Approximately 6.8 million cubic yards would be placed in the QLC North WRDF
  - Approximately 7.0 million cubic yards would be placed in the QLC East WRDF
  - Approximately 2.0 million cubic yards would be placed as QLC Pit backfill
  - Approximately 5.0 million cubic yards would be placed in the Dawn WRDF Western Extension
  - Approximately 5.7 million cubic yards would be placed in the Dawn WRDF Eastern Extension

2.4.2.6 QLC Area Pits and WRDFs Sequencing for Years 3 and 4

In years 3 and 4, mining in the QLC Pit eastern areas would be completed to allow for backfilling of those areas in years 5 and 6 as presented in **Figure 2-10**:

- There would be a smaller amount of waste rock removal in the western areas of the QLC Pit;
- The existing county road would continue to be re-routed through the haul road;
- Approximately 18.7 million cubic yards of in-situ waste rock material would be removed from the pits;
- A total of approximately 26.9 million cubic yards of waste rock would be placed in the following facilities:
  - 13.6 million cubic yards to the QLC East WRDF; and
  - 13.3 million cubic yards to the combined Dawn WRDF.

2.4.2.7 QLC Area Pits and WRDFs Sequencing for Years 5 and 6

Years 5 and 6 would consist of only mining the western areas of the QLC Pit as presented in **Figure 2-11**:

- Approximately 32% of QLC Pit in the eastern areas would be backfilled by the end of year 6;
- The existing county road would continue to be re-routed through the haul road;
- Approximately 18.1 million cubic yards of in-situ waste rock material would be removed from the QLC Pit;
- A total of approximately 27.1 million cubic yards of waste rock material would be placed in the following WRDFs or as pit back-fill:
  - Approximately 18.5 million cubic yards would be placed in the QLC East WRDF; and
  - Approximately 8.6 million cubic yards of backfill would be placed in QLC Pit in the eastern areas.

2.4.2.8 QLC Area Pits and WRDFs Sequencing for Years 7 and 8

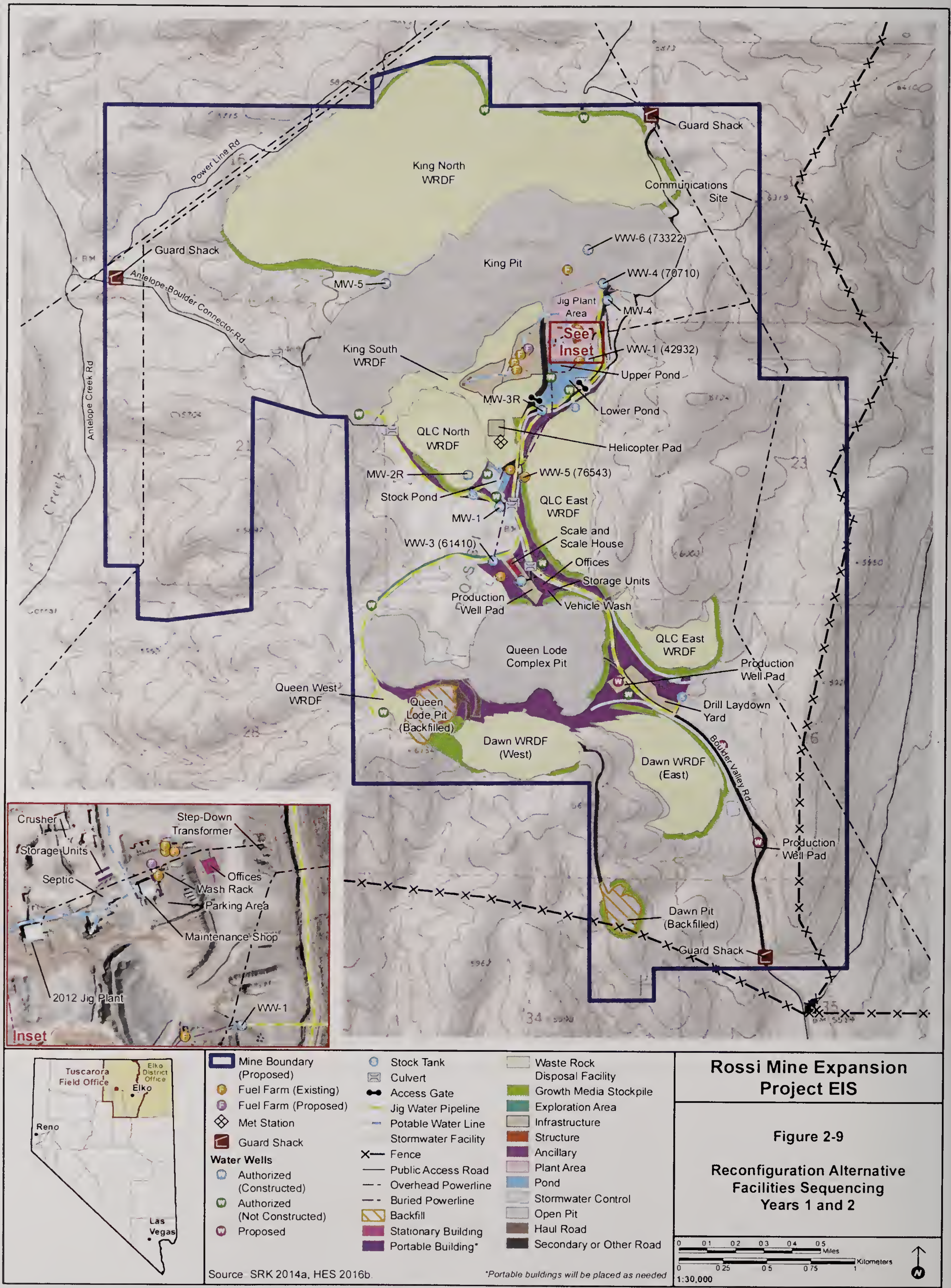
Years 7 and 8 would consist of only mining the QLC Pit in the western areas as presented in **Figure 2-12**:

- 100% of QLC Pit in the eastern areas would be backfilled by the end of year 8;
- The county road would continue to be routed through the haul road;

- 15.3 million cubic yards of in-situ material would be removed from the QLC Pit;
- A total of approximately 22.9 million cubic yards of waste rock material would be placed in the following WRDFs:
    - Approximately 4.6 million cubic yards would be placed in the Modified Dawn WRDF; and
    - Approximately 18.3 million cubic yards of backfill would be placed in the eastern areas of the QLC Pit.

2.4.2.9 Dawn WRDF Sequencing

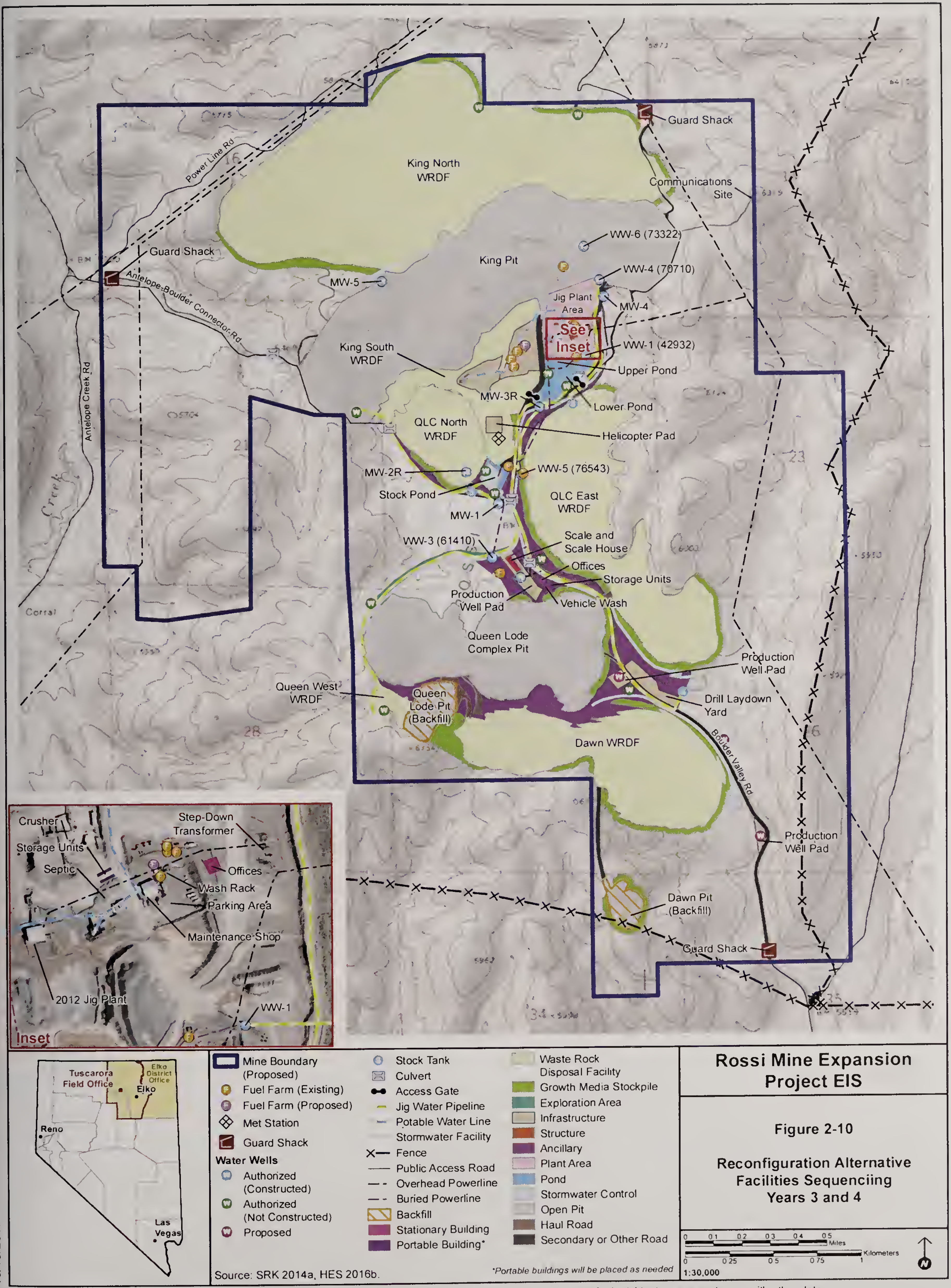
The sequencing of construction of the modified Dawn WRDF would be phased to ensure the conservation of approximately a minimum 2,000-foot-wide undisturbed corridor for use by migrating mule deer between the proposed Dawn WRDF on the north and the Arturo Mine facilities to the south (**Figure 2-8**). Sequencing of construction would occur during years 1–4 of the project. In years 1--2, the WRDF would be built in two separate lifts on the east and west end of the final Dawn WRDF footprint (**Figure 2-9**). In years 3–4 the remaining areas of the Dawn WRDF footprint would be constructed and concurrent reclamation would be implemented as practicable. Areas of the southern slope of the initial WRDF lift once constructed and stabilized, would be reclaimed concurrently in order to maintain approximately a minimum 2,000-foot-wide undisturbed corridor to allow for continued mule deer migration as shown in **Figure 2-8.**



Rossi Mine Expansion Project EIS

Figure 2-9

Reconfiguration Alternative Facilities Sequencing Years 1 and 2



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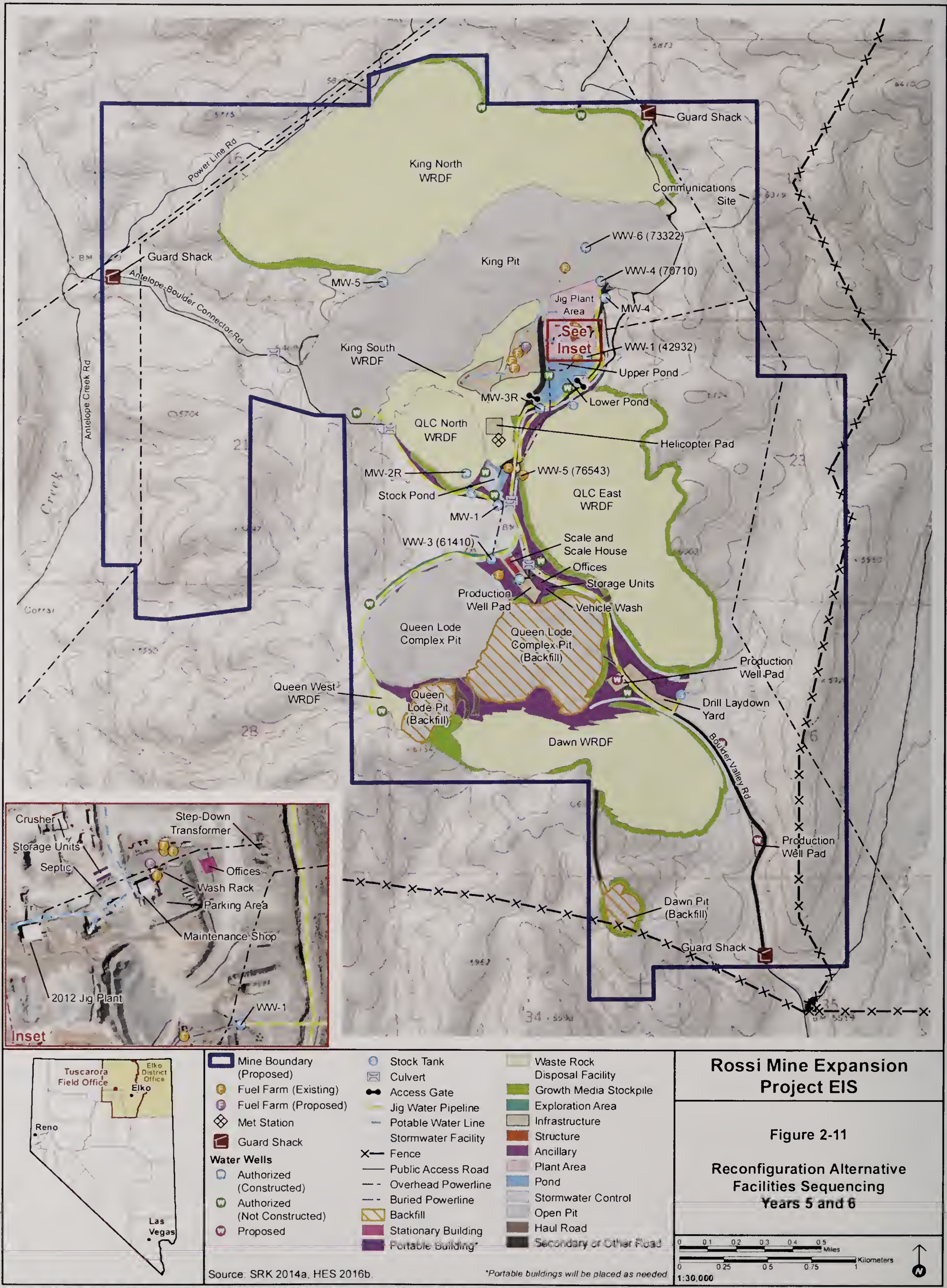

Figure 2-11

Reconfiguration Alternative Facilities Sequencing Years 5 and 6

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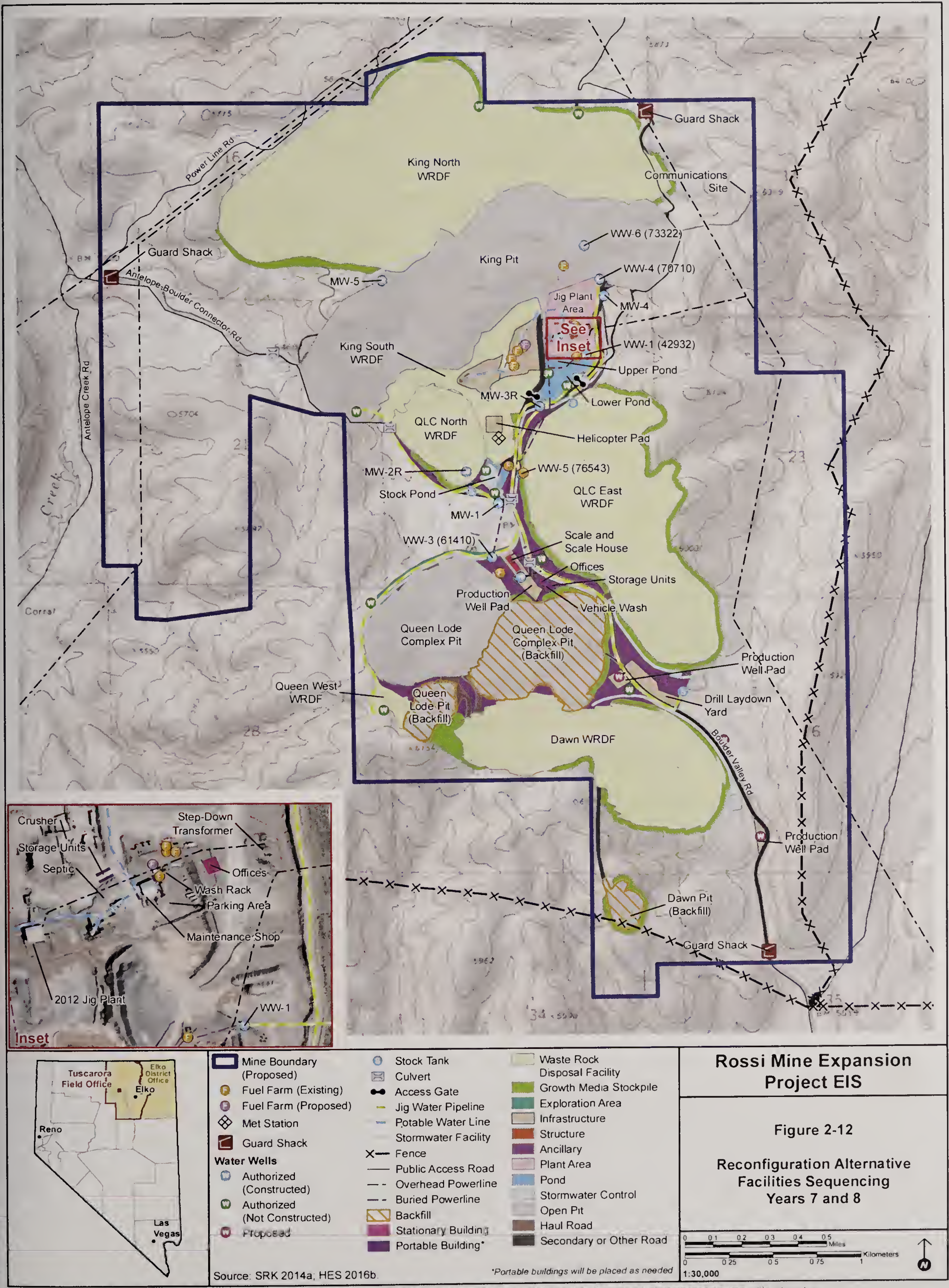

Rossi Mine Expansion Project EIS

Figure 2-12

Reconfiguration Alternative Facilities Sequencing Years 7 and 8

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2.4.2.10 Ore Processing

Ore stockpiling, ore crushing, and jig plant processing would be the same process as described for the Proposed Action in Section 2.3.7.

2.4.2.11 Haul, Secondary, and Public Access Roads

Haul, Secondary, and Public Access Roads would be the same as described for the Proposed Action (Section 2.3.8) with the addition of 2 acres of surface disturbance on private land resulting from road construction (**Table 2-18**).

2.4.2.12 Ancillary and Support Facilities

Under the Reconfiguration Alternative, the following ancillary and support facilities would be same as described for the Proposed Action (Section 2.3.9):

- Buildings and structures;
- Operational lighting;
- Power supply;
- Sanitary and solid waste disposal;
- Site security, signs, and fencing;
- Safety and fire protection;
- Water supply, demand, and management; and
- Stormwater management.

Fuel consumption of gasoline and kerosene would be the same as described for the Proposed Action (**Table 2-6**). Diesel fuel consumption on an annual basis would be approximately 22% less than the Proposed Action due to the fact that the Reconfiguration Alternative would use 8 fewer haul trucks per day (**Table 2-6**).

Hazardous materials management would be the same as described for the Proposed Action. The generation of hazardous materials and hazardous waste would be the same as the Proposed Action with the exception of antifreeze waste; under the Reconfiguration Alternative, approximately 22% less antifreeze waste would be generated compared with the Proposed Action (**Table 2-6**).

2.4.2.13 Exploration

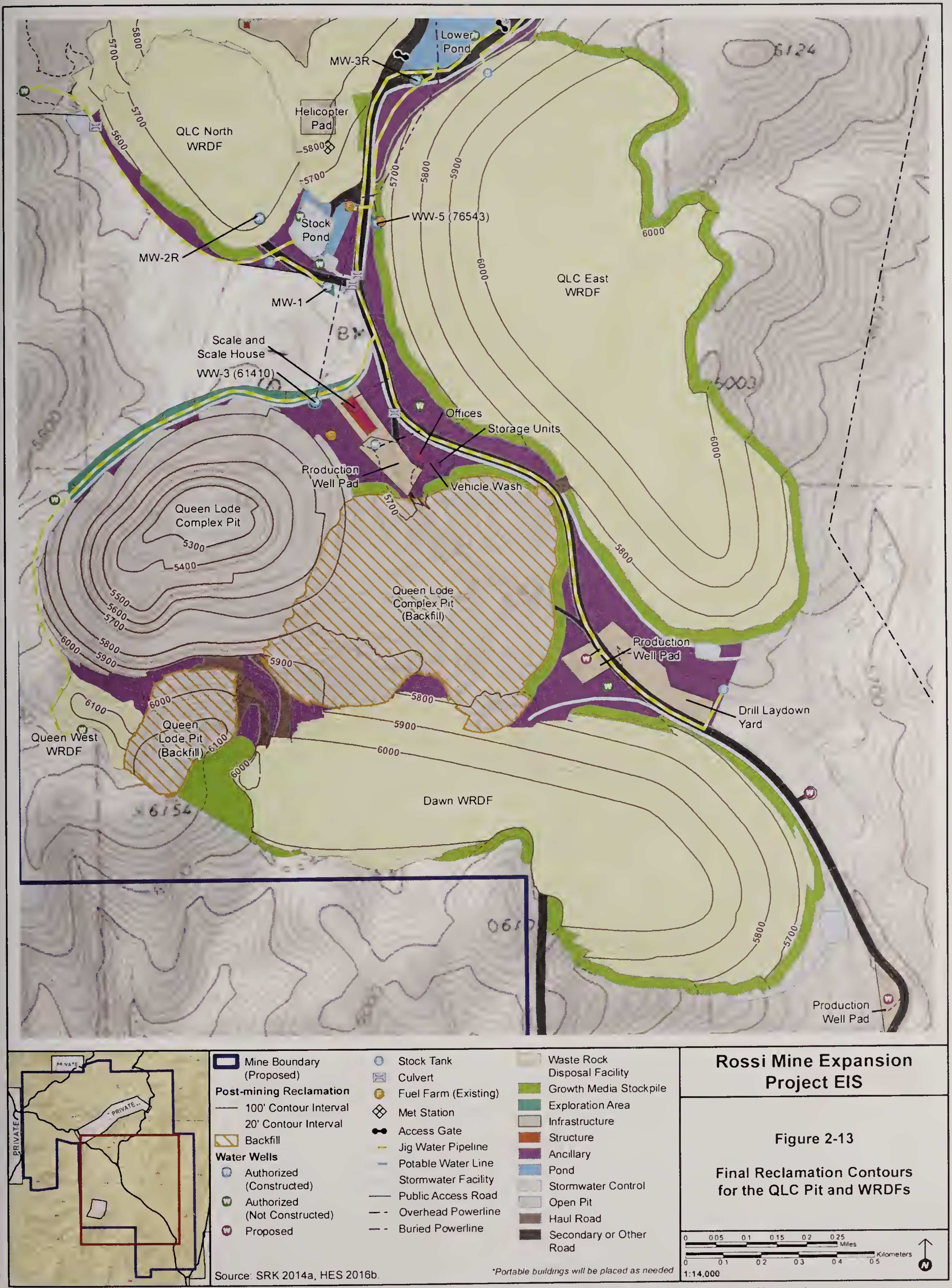
Exploration under the Reconfiguration Alternative would be the same as described for the Proposed Action (Section 2.3.10).

2.4.2.14 Growth Media Stockpiles

Under the Reconfiguration Alternative, growth media would be salvaged as described in Section 2.3.11 of the Proposed Action. **Figure 2-7** shows the locations of proposed growth media stockpiles.

2.4.2.15 Closure and Reclamation Plan

The closure and reclamation plan for the Reconfiguration Alternative would be the same as described for the Proposed Action in Section 2.3.12, with the exception that the eastern portion of the QLC Pit would be completely backfilled with waste rock. **Figure 2-13** presents the final contours of the reclaimed mine facilities for the QLC area pits and WRDFs (contoured to slopes of 2.5H:1V, but not to exceed 3H:1V) and **Figure 2-14** presents the final reclaimed mine facilities for the entire Reconfiguration Alternative.



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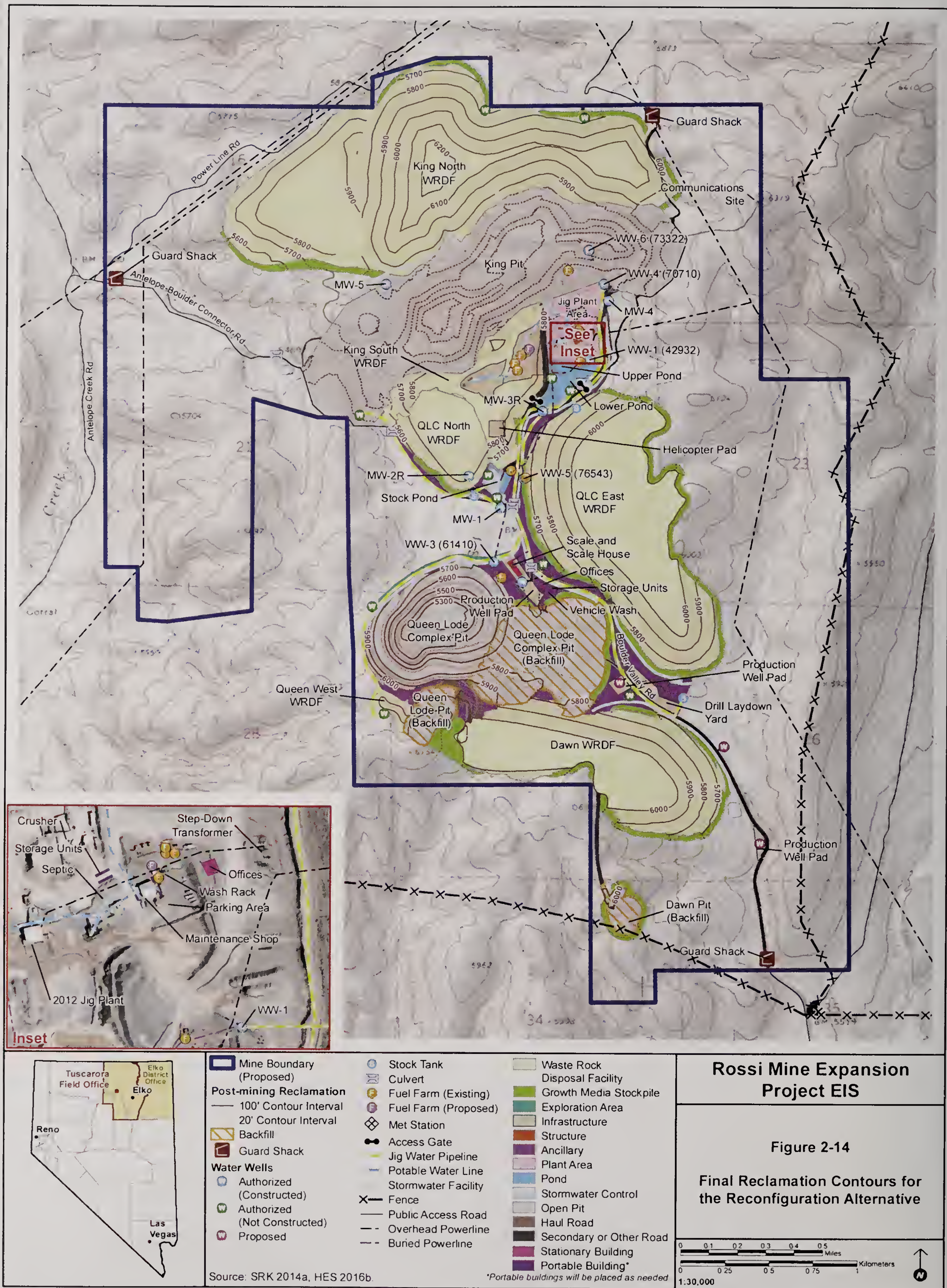

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2.4.3 Livestock Fencing Alternative

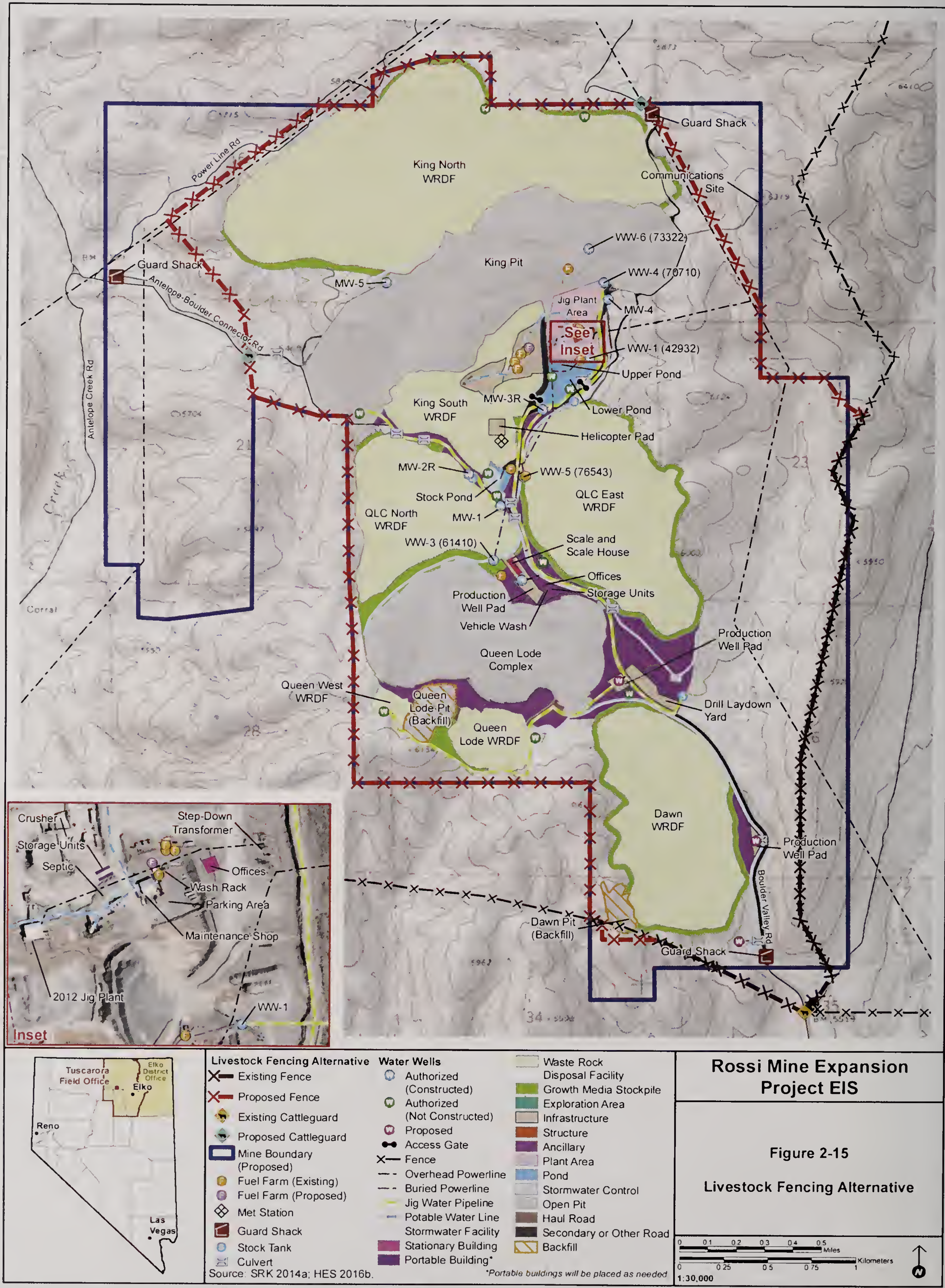
BLM decided that a livestock fencing alternative would be analyzed in detail in the EIS based on communications between the BLM and a local livestock grazing permittee. The local grazing permittee communicated their concern to the BLM of free ranging livestock continuing to enter into an expanded, active mining area and the potential for livestock collisions with mining equipment or vehicles. Approximately up to 2,500 head of cattle are currently allowed to graze within the vicinity of the Rossi Mine on the Twenty-Five Allotment.

Under the Proposed Action and Reconfiguration Alternative, an increase of mining activity and traffic would result due to the expansion of the King South WRDF, QLC North WRDF, and the QLC East WRDF. These facility expansions in conjunction with the stock watering tank could result in an increase of cattle being exposed to potential collisions with mining activity and mine traffic. Under the Livestock Fencing Alternative (Fencing Alternative), a three or four strand, wildlife friendly livestock exclusion fence would be installed around the perimeter of the mine facilities as shown in **Figure 2-15**. All other aspects of the Proposed Action and Reconfiguration Alternative would remain the same if the Fencing Alternative is determined to be implemented with the preferred alternative.

The proposed fence would be approximately 7.3 miles in total length and would enclose a total of 2,967 acres, of which 2,755 acres are public lands and 211 acres are private lands owned by Barrick. The perimeter fence would cross the Boulder Valley Road on the southern and northern-most ends of the Rossi Mine boundary and the Antelope-Boulder Connector Road to the west of the King Pit. New cattleguards would be installed across the Antelope-Boulder Connector Road and Boulder Valley Road at the northernmost end of the mine boundary. On the ground adjustments to the proposed fence location may be made to utilize ties to the existing fence and cattleguard at the southern-most end of the mine boundary.

The fence would be constructed using either wood or metal pipe for the posts, along with metal t-posts. A combination of smooth and barbed wire would be utilized. The posts would be spaced approximately 16.5 feet apart. The wire spacing would be wildlife friendly with a smooth bottom strand of wire. The 3-strand fence would be built with a top strand measuring 40 inches from the ground surface, a middle strand measuring 28 inches from the ground surface and a bottom strand measuring 18 inches from the ground surface. The 4-strand fence would be built with a top strand measuring 42 inches from the ground surface, the top middle strand measuring 30 inches from the ground surface, the bottom middle strand measuring 22 inches from the ground surface and the bottom strand measuring 16 inches from the ground surface. The majority of fencing under this alternative would be wildlife friendly 3-strand fence. The 4-strand fencing would be installed in areas of high livestock use including loafing or watering areas. The trough located near the stock pond would be removed. Gates would be installed as needed in the fence line in order to maintain access to the communications site, power lines, and pipelines.

Construction of the fence would be completed using light duty pick-up trucks to access the installation site. It is anticipated that a maximum of two pick-up trucks would use existing roads and 2-tracks to install the fence. In locations where an existing road is not available, construction staff would use pick-up trucks to drive overland along the fence line, resulting in minor temporary surface disturbance to vegetation at the site. Construction staff would use a gas powered auger to install the wood and metal posts as needed, resulting in approximately one square foot of surface disturbance at each post location. T-posts would be driven straight into the ground resulting in negligible surface disturbance. Depending on the number of wood and metal posts that are used to install the fencing, up to 2,336 square feet or approximately 0.05 acres of surface disturbance would result from installation of posts. This disturbance would persist until the fence is removed at the end of mine operations and reclamation. If the Livestock Fencing Alternative is included in the Preferred Alternative for the project, the fence would be installed within twelve months of Rossi Project approval and would require approximately six months to complete.



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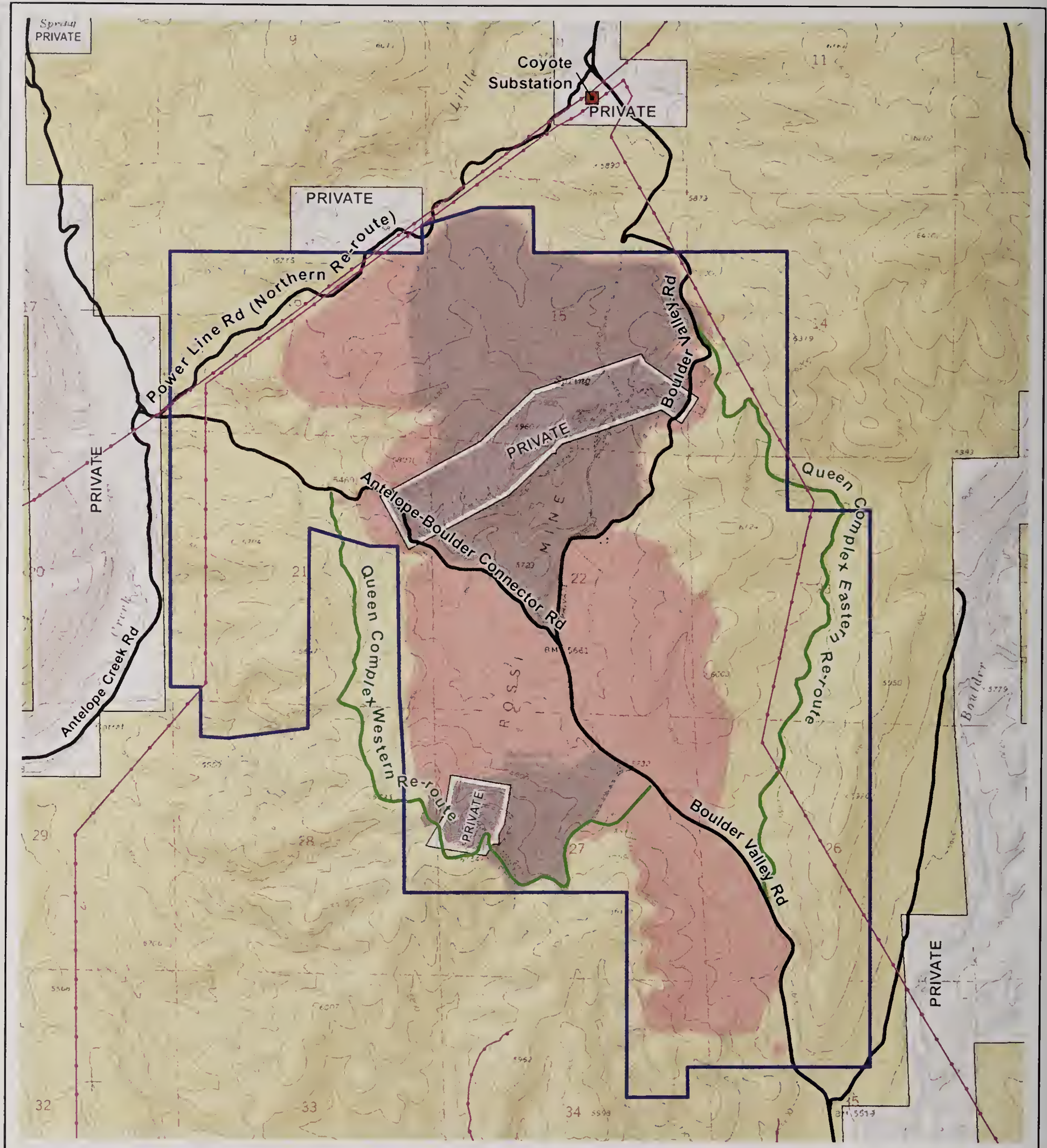
2.4.4 Alternatives Considered but Eliminated from Detailed Analysis

This section describes the alternatives considered but subsequently eliminated from detailed analysis by the BLM and the rationale for their elimination. The alternatives were considered and carefully evaluated with regard to their ability to address the identified purpose and needs of the EIS process, their technological and economic feasibility, as well as their potential to address environmental issues and reduce potential impacts.

2.4.4.1 Public Access Road Realignment Alternative Options

Under this alternative, portions of the Boulder Valley Road and Antelope-Boulder Connector Road would have been re-aligned to remove unrestricted vehicle access to active mining areas while continuing to provide similar levels of access to public lands for recreation or other uses. This alternative was reviewed to address the perceived public safety issue resulting from allowing public vehicles access to active mining areas. The BLM and HES reviewed three potential re-routing options to provide public access to BLM managed lands including the Queen Complex Eastern re-route, the Queen Complex Western re-route, and the Northern re-route as shown in **Figure 2-16**. These are described in more detail in the sections that follow.



Mine Boundary (Proposed)
Existing and Authorized Disturbance
Proposed New Disturbance

Land Status

Bureau of Land Management
Private

Public Access Routes

Existing/Authorized
Public Access Re-route Options

Existing and Reasonably Foreseeable Projects

Substation
Transmission Line

Source: SRK 2014a, BLM 2015b, g

Rossi Mine Expansion Project EIS

Figure 2-16

Public Access Road Re-route Options
(Township 37 North, Range 49 East)

0 0.1 0.2 0.3 0.4 0.5 Miles
0 0.25 0.5 0.75 1 Kilometers
1:35,000

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Queen Complex Eastern Re-route

Under the Queen Complex Eastern re-route, public access along the Boulder Valley road to the existing Coyote substation would be diverted from the existing road away from mining activity to the east of the PoO area as shown in **Figure 2-16**. The total length of re-route would be approximately 3.28 miles with an average grade of 4% and a maximum grade of 11%. The anticipated new surface disturbance resulting from construction of this alternative would be approximately 40 acres assuming a 24-foot-wide running surface and a 100-foot-wide right of way (ROW).

This alternative was dismissed from further analysis for several reasons. The majority of the re-route would occur in a draw where there is significant drainage. Road construction would require substantial side-hilling and cuts resulting in an increase in erosion and sedimentation impacts to the draw, with greater overall impacts. Construction of this re-route would impact cultural resources known to occur along the route. Lastly, this re-route would bring public vehicles close to existing power lines, towers, and guy wires maintained by NV Energy.

Queen Complex Western Re-route

Under the Queen Complex Western re-route, public access along the Antelope Creek road would be diverted to the western side of the existing QLEE pit and PoO boundary as shown in **Figure 2-16**. This re-route would be approximately 2.08 miles in length with an average grade of 7% and a maximum grade of 13.8%. Approximately 1.16 miles of this re-route would be on existing drill and old public access roads with existing disturbance. The anticipated new surface disturbance resulting from construction of this alternative would be approximately 25 acres assuming a 24-foot-wide running surface and a 100-foot-wide ROW.

This alternative was dismissed from further analysis in that the steep road grades alone would make it difficult to maintain and for the public to use this road, particularly in inclement weather. In addition, the Queen Complex Western re-route has substantial road construction occurring in a draw with increases in erosion and sedimentation in the drainage and significant construction costs.

Northern Re-route

The Northern re-route alternative is a combination of the previously discussed Queen Complex Eastern re-route and a new section of road that would follow the existing power line ROW owned and maintained by NV Energy. Under the Northern re-route, public access along the Boulder Valley road to the existing Coyote substation would be diverted from the existing road to the east of the PoO area, then diverted west along the north side of the PoO boundary to eventually connect with the Antelope Creek road as shown in **Figure 2-16**. This re-route would be approximately 6.42 miles in total length and would use 0.80 mile of existing county road. The average and maximum road grade would be approximately 8% and 13.8%, respectively. The anticipated new surface disturbance resulting from construction of this alternative would be approximately 78 acres assuming a 24-foot-wide running surface and a 100-foot-wide ROW.

This alternative was dismissed from further analysis as the road grade is very steep and would make maintenance and public access difficult. The Northern re-route would result in substantial impacts to cultural and surface water resources and would bring public vehicles close to existing power lines, towers, and guy wires maintained by NV Energy.

Summary of Public Access Road Realignment Alternative Options

All three re-route options were determined to not provide a significant benefit through the reduction of potential public safety issues associated with public vehicles moving through the mining area. HES has conducted traffic counts within the mine area and has determined that traffic from public vehicles is generally low in comparison to other public access roads in the mine area, although some increases in traffic volume has been observed during periods of open big game hunting seasons. HES has not recorded any vehicle safety incidents within the Rossi Mine area during its tenure as the Rossi Mine operator (SRK 2014a).

2.5 BLM Preferred Alternative

The BLM has selected a preferred alternative based on the detailed analysis provided in this EIS. The preferred alternative is the alternative that best fulfills the agency's statutory mission and responsibilities, considering economic, environmental, technical, and other factors and having considered and addressed preliminary comments provided on the draft EIS. The BLM has determined that the preferred alternative is the Reconfiguration Alternative.

3.0 Affected Environment and Environmental Consequences

3.1 Introduction

This chapter summarizes the affected environment and environmental consequences for the proposed Rossi Mine Expansion Project and alternatives analyzed in this EIS. It also includes a description of the past, present, and reasonably foreseeable future actions (RFFAs) that may result in cumulative impacts with the proposed project or alternatives.

Alternatives analyzed in this chapter include the Proposed Action, the Reconfiguration Alternative, the Livestock Fencing Alternative, and the no Action Alternative. The Public Access Road Realignment Alternative options were eliminated from detailed analysis and is described in Section 2.4.4.1.

Baseline information summarized and presented in this chapter was obtained from published and unpublished materials; discussions with local, state, and federal agency staff; field and laboratory studies conducted in the project area; and on-site experience with mining and reclamation. The affected environment for individual resources was delineated based on the area of potential direct and indirect environmental impacts for the proposed project. For resources such as soils and vegetation, the affected area was determined to be the physical location of the areas to be disturbed by the proposed project. For other resources such as water quality, air quality, wildlife, social and economic values, and the transport of hazardous materials, the affected environment analysis covers a larger area, as described in each resource section.

This chapter also describes the anticipated direct and indirect impacts of the proposed project and the alternatives, as well as potential cumulative impacts. The analysis of potential impacts from the proposed project assumes the implementation of regulatory requirements and the Applicant Committed Environmental Protection Measures presented in Section 2.3.13 that would be implemented in association with the proposed project. Potential mitigation and monitoring developed in response to anticipated impacts for individual resources are presented and analyzed by the BLM at the end of each resource section. This chapter also identifies residual impacts, which are impacts that would remain after mitigation measures have been implemented.

The proposed project may result in cumulative effects associated with other past, present, and RFFAs in the area. BLM Instructional Memorandum NV-90-435 specifies that impacts first must be identified for the proposed project before cumulative impacts with past, present, and RFFAs can be assessed. For resources where project-specific impacts are identified, the cumulative effects associated with the proposed project were evaluated together with other past, present, and RFFAs. The period of potential cumulative impact is defined as the approximately 8-year mine life of the project followed by 5 years of reclamation. The cumulative effects analysis for each resource addressed the potential cumulative effects within the resource-specific cumulative effects study area (CESA). Cumulative effects, including descriptions of and rationale used to develop CESAs, are discussed on a resource-by-resource basis in Chapter 3.0.

The project area for the Proposed Action is the area within and including the PoO boundary and other proposed elements including the Boulder Valley Road, jig plant processing area, haul roads, and secondary access roads. Elements of the project area are shown in **Figure 2-4**. The study area is the area assessed for direct and indirect impacts and is defined individually for each resource, and may or may not be the same as the project area. The study area is defined generally as those areas where direct and indirect impacts would occur for a specific resource as a result of the Proposed Action. The study area may vary by resource and is defined in each affected resource section. Direct and indirect impacts would occur within the project area for most affected resources; some indirect impacts may affect the adjacent or immediate area surrounding the project area. The project vicinity is defined as those areas within 20 miles of the project area.

CESA boundaries are also defined individually for each resource, and may include a larger area than the study area assessed for direct and indirect impacts. The project region is defined as an area larger than the CESA and is a more generalized area without specific boundaries.

An introduction to and descriptions of past, present, and RFFAs projects is presented in Section 3.2. The remaining sections in Chapter 3.0 are organized by affected resources within the study area. Subsections for each resource include:

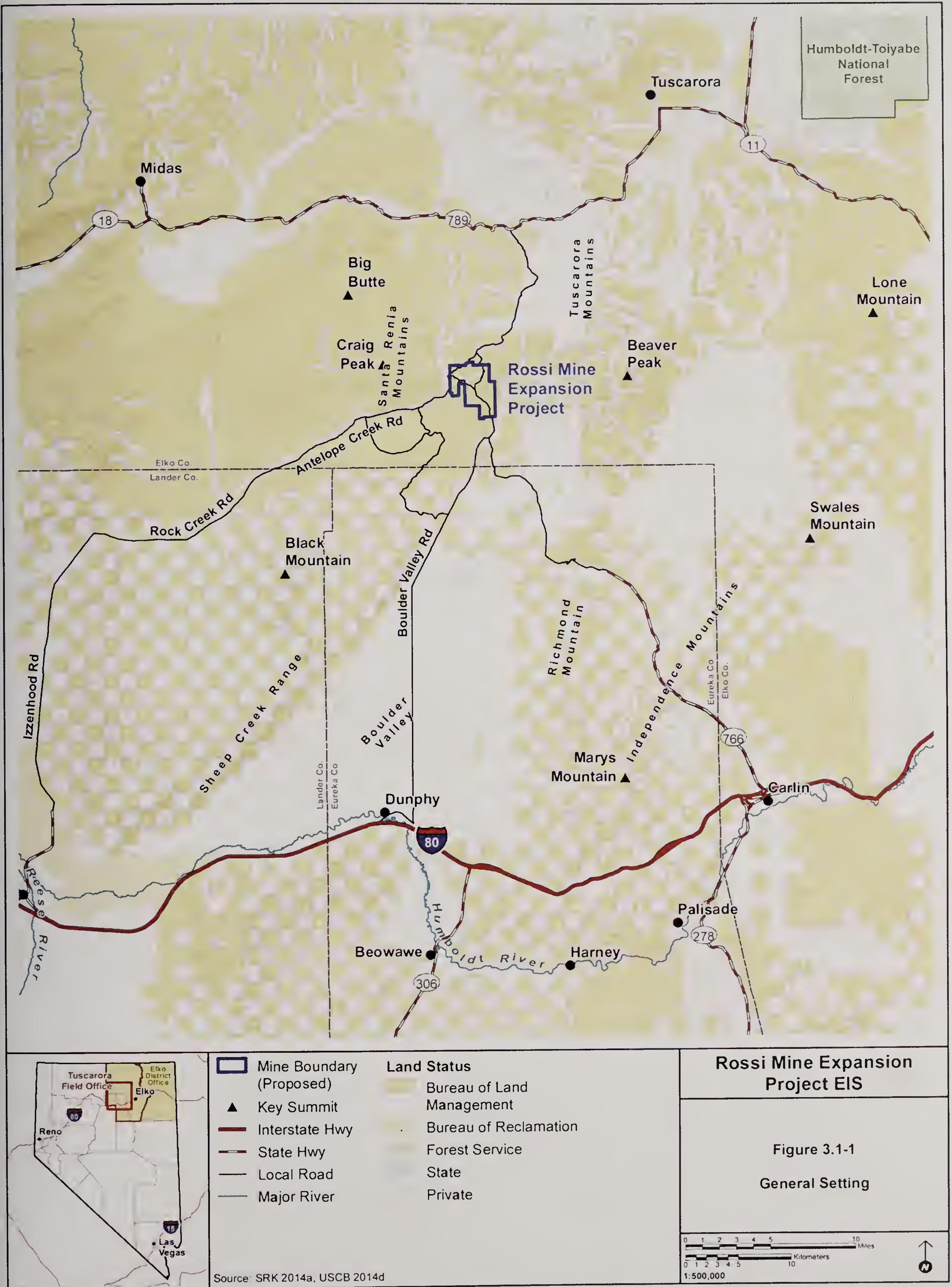
1. Affected Environment;
2. Environmental Consequences (discussed for the Proposed Action and all alternatives);
3. Cumulative Impacts;
4. Potential Monitoring and Mitigation; and
5. Residual Impacts.

Energy requirements for the Proposed Action and alternatives are provided in Section 3.22, Energy and Climate Change. The short-term use of the environment relative to the long-term productivity of resources is discussed in Section 3.23, Relationship between Short-term Uses of the Human Environment and the Maintenance and Enhancement of Long-term Productivity. Short-term is defined as the life of the proposed project or less (proposed plan is 8 years of mine operation followed by 5 years of reclamation). Long-term impacts are defined as impacts that would continue post-reclamation and closure. Long-term impacts could persist in perpetuity, depending upon the location and severity of impact and the ability of each affected resource to successfully return to pre-mining conditions. The irreversible or irretrievable commitment of resources is described in Section 3.24, Irreversible and Irretrievable Commitment of Resources.

3.1.1 General Setting

The proposed Rossi Mine Expansion Project is located in northern Nevada as shown in **Figure 3.1-1**. The surrounding terrain consists of alternating mountain ranges and sagebrush-covered valleys, with the proposed project site situated in the Basin and Range physiographic province. This region is characterized by large, extensive valleys located between mountain ranges. The proposed project is located at the northern end of Boulder Valley with the Sheep Creek Range to the southwest and the Tuscarora Mountains to the east and north.

Elevations at the project location range from approximately 5,240 feet to 6,150 feet amsl. The climate is marked by extreme weather conditions characterized as arid and accompanied by temperatures ranging from -20 degrees Fahrenheit (°F) to more than 100°F. Overall precipitation is approximately 5 to 9 inches per year, with erratic rainfall patterns that tend to be localized. The proposed project is located within the Humboldt River Hydrographic Region, Boulder Flat sub-basin.



Rossi Mine Expansion Project EIS

Figure 3.1-1

General Setting

2/20/2018

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Original data were compiled from various sources. This information may not meet National Map Accuracy Standards.
This product was developed through digital means and may be updated without notice.

3.1.2 Supplemental Authorities

To comply with the NEPA, and in accordance with the BLM NEPA Handbook (H-1790-1) (BLM 2008b) and with further guidance provided in Instruction Memorandum No. NV-2009-030, the BLM is required to address specific elements of the human environment that are subject to requirements specified in statute, regulation, or Executive Order (EO) (i.e., supplemental authorities). **Table 3.1-1** lists the supplemental authorities that must be addressed in all environmental analyses, as well as other resources deemed appropriate for evaluation by the BLM, and denotes if the Proposed Action or No Action Alternative affects those elements. Other resources of the human environment that have been considered for this EIS are listed in **Table 3.1-2**. Resources that may be affected are further described in the EIS. The rationale for those resources that would not be affected by the Proposed Action and the alternatives are identified in **Table 3.1-1** and **Table 3.1-2**.

Table 3.1-1. Supplemental Authorities to be Considered

Supplemental Authority[1]	Not Present[2]	Present/ Not Affected	Present/May Be Affected[3]	Rationale
Air Quality			X	Section 3.8
Area of Critical Environmental Concern	X			Would not be affected. Resource is not present within or near the proposed project area.
Cultural/Historical			X	Section 3.5
Environmental Justice			X	Section 3.21
Farmlands (Prime or Unique)	X			Would not be affected. Resource is not present within or near the proposed project area.
Noxious Weeds and Invasive Non-native Plant Species			X	Section 3.15
Native American Religious Concerns			X	Section 3.6
Floodplains	X			Would not be affected. Resource is not present within or near the proposed project area.
Riparian/Wetlands			X	Section 3.14
Special Status Species			X	Section 3.18
Migratory Birds			X	Section 3.17
Waste (Hazardous and Solid)			X	Section 3.7
Water Quality			X	Section 3.4
Wild and Scenic Rivers	X			Would not be affected. Resource is not present within or near the proposed project area.
Wilderness			X	Section 3.11
Forests and Rangelands[4]	X			Would not be affected. Resource is not present within or near the proposed project area.

Table 3.1-1. Supplemental Authorities to be Considered

Supplemental Authority[1]	Not Present[2]	Present/ Not Affected	Present/May Be Affected[3]	Rationale
Human Health and Safety		X		Under EO 13045, children are protected from environmental health and human safety risks. In accordance with EO 13045, the Proposed Action would not use pesticides or herbicides in locations where children would be exposed. Therefore, the Proposed Action poses no health and human safety risk as it relates to EO 13045, and health and human safety is not addressed further in this EIS.
Energy/Greenhouse Gases[5]				Section 3.22

Sources: BLM 2008b; CEQ 2010.

[1] See H-1790-1 Appendix 1 for supplemental authorities to be considered.
[2] Supplemental authorities determined not to be present or present/not affected are not carried forward for analysis or discussed further in this EIS.
[3] Supplemental authorities determined to present/may be affected are carried forward for analysis in this EIS.
[4] Healthy Forests Restoration Act only.
[5] The Department of Interior's Secretarial Order 3349 entitled *American Energy Independence and Economic Growth* was issued on March 28, 2017, and among other provisions, directs the CEQ to rescind their guidance requiring agencies to consider greenhouse gas emissions and effects of climate change in NEPA documents. Although the CEQ guidance was rescinded, this EIS discloses Greenhouse Gas (GHG) emissions from the proposed project and the effects of climate change.

Table 3.1-2. Other Resources of the Human Environment Considered

Other Resources	Not Present[1]	Present/ Not Affected	Present/May Be Affected	Rationale
Grazing Management			X	Section 3.16
Land Use Authorization			X	Section 3.19
Minerals			X	Section 3.3
Paleontological Resources			X	Section 3.9
Recreation			X	Section 3.11
Lands with Wilderness Characteristics			X	Section 3.11
Social and Economic Values			X	Section 3.10
Soils			X	Section 3.13
Vegetation			X	Section 3.14
Visual Resources			X	Section 3.12
Wild Horses and Burros	X			Would not be affected. Wild horses are not present within or near the proposed project area.
Wildlife			X	Section 3.17

[1] Other resources determined not to be present or present/not affected are not carried forward for analysis or discussed further in this EIS based on the rational provided.

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3.2 Past, Present, and Reasonably Foreseeable Future Actions

This section summarizes past, present, and RFFAs for the Proposed Action and forms the basis for the discussion of cumulative impacts. Cumulative impacts under NEPA are defined by the CEQ as:

> *"the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time" (40 Code of Federal Regulations 1508.7).*

BLM Instruction Memorandum NV-90-435 specifies that impacts first must be identified for the proposed project before cumulative impacts with past, present, and RFFAs can occur. Cumulative effects are discussed on a resource-by-resource basis in Chapter 3.0 sections, including the description of and rationale used to develop individual resource CESAs.

Relevant projects and actions are defined for the EIS as those past, present, and RFFAs that could interact with the Proposed Action or alternatives in a manner that would result in cumulative impacts, resulting primarily from mining, commercial activities, and public uses.

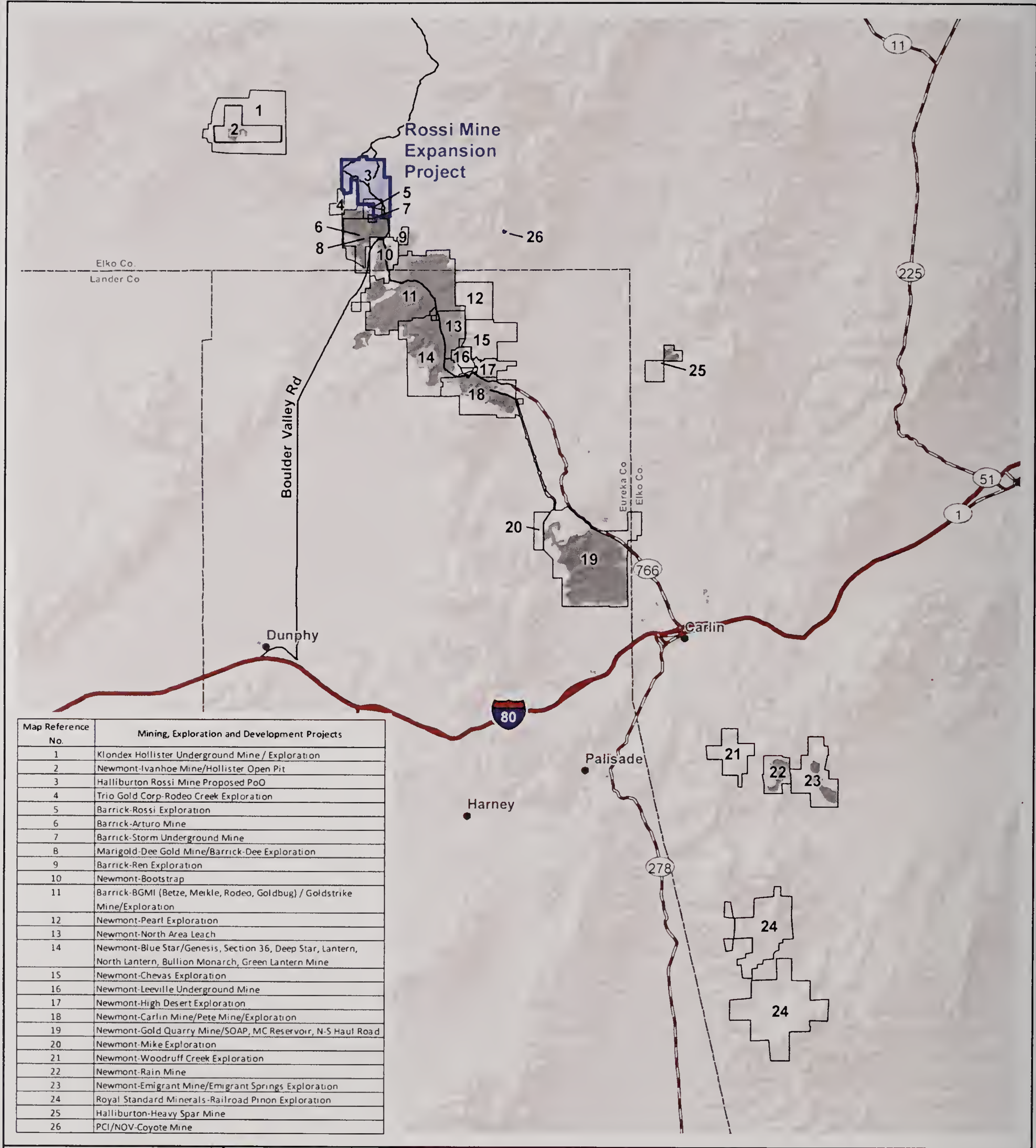
The extent of the geographic area for which past, present, and RFFAs are described in this EIS varies by resources and generally encompasses the Carlin Trend. The Carlin Trend is a mineralized zone approximately 38 miles long, in a north-northwest alignment of predominately carbonate-hosted gold deposits located in northeastern Nevada (Teal and Jackson 2002). Mining and mineral exploration are the primary surface-disturbing actions in the vicinity and active mining operations have occurred over the past century. For the purposes of this EIS, the Carlin Trend extends from the Hollister Mine, northwest of the Town of Carlin, to the Rain Mine, southeast of Carlin. The past, present, and RFFAs recently identified in the mining cumulative effects studies for the Arturo Mine Project EIS (BLM 2012a) and the Hollister Underground Mine Project EIS (BLM 2012b) were reviewed and considered for inclusion in this section. In addition, results of a review of the BLM Land and Mineral Legacy Rehost 2000 System (LR2000) database were considered for this section (BLM 2015b).

3.2.1 Past and Present Actions

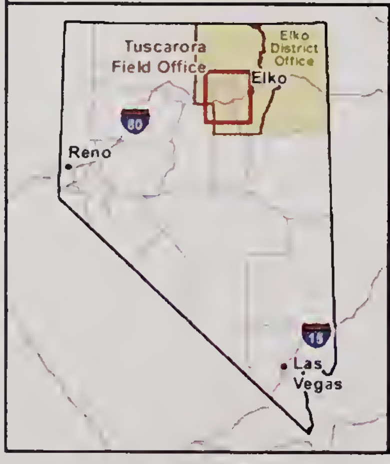
Past and present development projects and other actions include historic and ongoing activities including mining, grazing, recreation, other commercial activities, and wildfire occurrence. Past and present projects and actions considered in the cumulative effects analysis are described below.

3.2.1.1 Mining-related Disturbance

The discovery of gold within the Carlin Trend occurred in 1907 at Lynn Creek, located approximately 19 miles northwest of the current town of Carlin, Nevada (Tingley 1998). **Figure 3.2-1** illustrates current mining and exploration disturbance within the Carlin Trend. **Figure 3.2-2** illustrates mining and exploration projects and some right-of-way (ROW) actions in the vicinity of the Carlin Trend. Surface disturbance acreages associated with the mining and mineral exploration in the Carlin Trend are identified in **Figure 3.2-1**.



Map Reference No.	Mining, Exploration and Development Projects
1	Klondex Hollister Underground Mine / Exploration
2	Newmont-Ivanhoe Mine/Hollister Open Pit
3	Halliburton Rossi Mine Proposed PoO
4	Trio Gold Corp-Rodeo Creek Exploration
5	Barrick-Rossi Exploration
6	Barrick-Arturo Mine
7	Barrick-Storm Underground Mine
8	Marigold-Dee Gold Mine/Barrick-Dee Exploration
9	Barrick-Ren Exploration
10	Newmont-Bootstrap
11	Barrick-BGMI (Betze, Meikle, Rodeo, Goldbug) / Goldstrike Mine/Exploration
12	Newmont-Pearl Exploration
13	Newmont-North Area Leach
14	Newmont-Blue Star/Genesis, Section 36, Deep Star, Lantern, North Lantern, Bullion Monarch, Green Lantern Mine
15	Newmont-Chevas Exploration
16	Newmont-Leeville Underground Mine
17	Newmont-High Desert Exploration
18	Newmont-Carlin Mine/Pete Mine/Exploration
19	Newmont-Gold Quarry Mine/SOAP, MC Reservoir, N-S Haul Road
20	Newmont-Mike Exploration
21	Newmont-Woodruff Creek Exploration
22	Newmont-Rain Mine
23	Newmont-Emigrant Mine/Emigrant Springs Exploration
24	Royal Standard Minerals-Railroad Pinon Exploration
25	Halliburton-Heavy Spar Mine
26	PCI/NOV-Coyote Mine



Project Study Area
Mine Plan Boundaries
Developed Areas
Quarries-Strip Mines-Gravel Pits

Source: BLM 2010b, USCB 2014d, SRK 2014a.

Rossi Mine Expansion Project EIS

Figure 3.2-1

Existing Mining Disturbance and Plans of Operation Boundaries within the Carlin Trend

0 1 2 3 4 5 10 Miles
0 1 2 3 4 5 10 Kilometers
1:500,000

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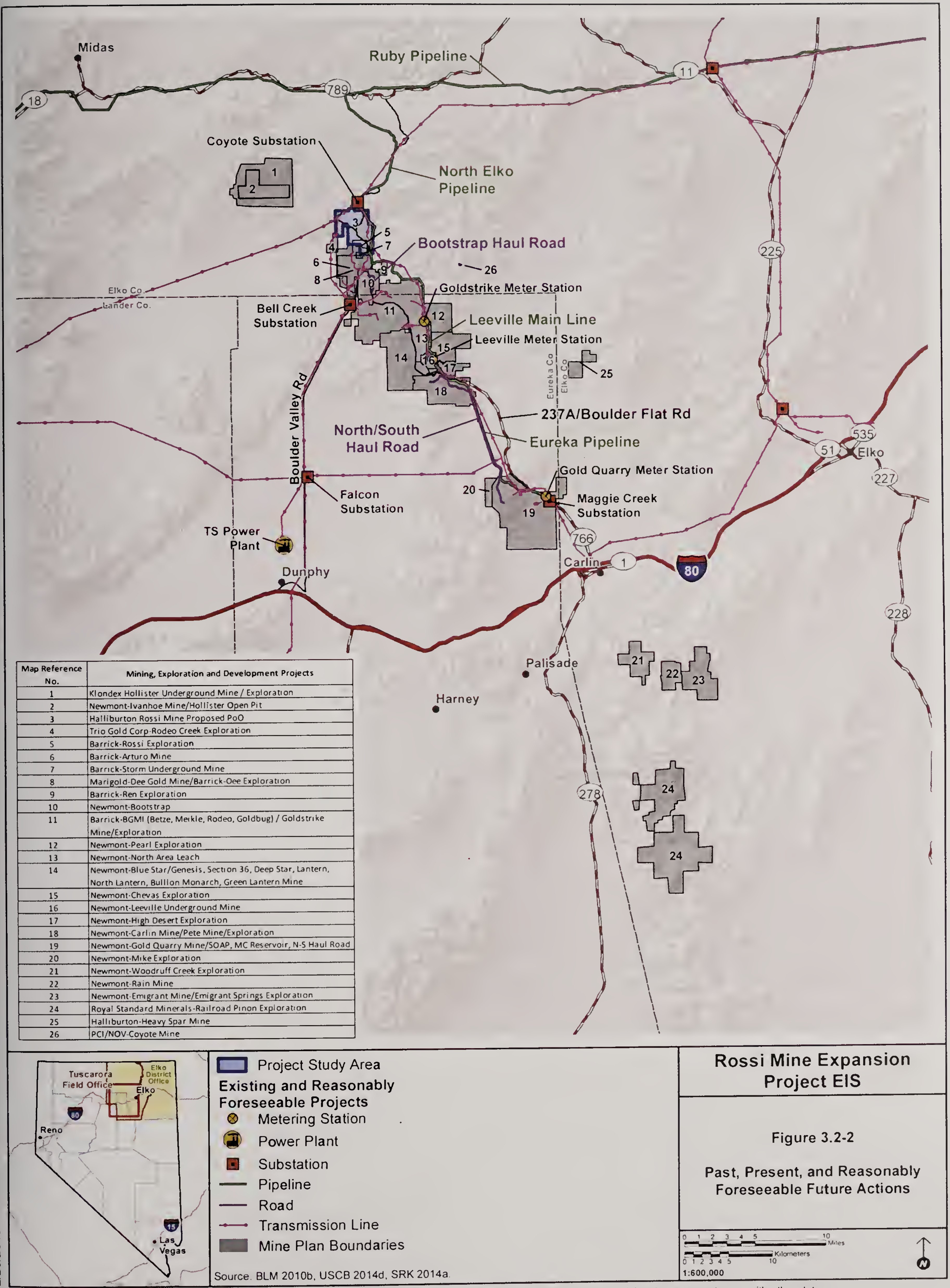

Map Reference No.	Mining, Exploration and Development Projects
1	Klondex Hollister Underground Mine / Exploration
2	Newmont-Ivanhoe Mine/Hollister Open Pit
3	Halliburton Rossi Mine Proposed PoO
4	Trio Gold Corp-Rodeo Creek Exploration
5	Barrick-Rossi Exploration
6	Barrick-Arturo Mine
7	Barrick-Storm Underground Mine
8	Marigold-Dee Gold Mine/Barrick-Dee Exploration
9	Barrick-Ren Exploration
10	Newmont-Bootstrap
11	Barrick-BGMI (Betze, Meikle, Rodeo, Goldbug) / Goldstrike Mine/Exploration
12	Newmont-Pearl Exploration
13	Newmont-North Area Leach
14	Newmont-Blue Star/Genesis, Section 36, Deep Star, Lantern, North Lantern, Bullion Monarch, Green Lantern Mine
15	Newmont-Chevas Exploration
16	Newmont-Leeville Underground Mine
17	Newmont-High Desert Exploration
18	Newmont-Carlin Mine/Pete Mine/Exploration
19	Newmont-Gold Quarry Mine/SOAP, MC Reservoir, N-S Haul Road
20	Newmont-Mike Exploration
21	Newmont-Woodruff Creek Exploration
22	Newmont-Rain Mine
23	Newmont-Emigrant Mine/Emigrant Springs Exploration
24	Royal Standard Minerals-Railroad Pinon Exploration
25	Halliburton-Heavy Spar Mine
26	PCI/NOV-Coyote Mine

Project Study Area

Existing and Reasonably Foreseeable Projects

- Metering Station
- Power Plant
- Substation
- Pipeline
- Road
- Transmission Line
- Mine Plan Boundaries

Source. BLM 2010b, USCB 2014d, SRK 2014a.

Rossi Mine Expansion Project EIS

Figure 3.2-2

Past, Present, and Reasonably Foreseeable Future Actions

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Table 3.2-1. Mine and Mineral Surface Disturbance Associated with Past, Present, and RFFAs

Map Reference No. (Figure 3.2-2)	Action (Applicant – Project)	Past and Present Disturbance (Acres)	RFFA Projected Disturbance (Acres)[1]	Total Approved/ Projected Disturbance (Acres)[1]
Mining Projects				
3	Halliburton Energy Services – Rossi Mine Expansion	912*	1,167	2,063*
11	Barrick/BGMI – Betze, Meikle, Rodeo, Goldbug Mines	9,062	0	9,062
8	Marigold/Goldcorp – Dee Gold Mine	83	0	83
7	Barrick Storm Inc. – Storm Underground Mine	0[2]	0	0
6	Barrick Dee Mining Venture – Arturo Mine	2,774	0	2,774
2	Newmont Mining Corporation (Newmont) – Ivanhoe/Hollister Open pit Mine	224	0	224
1	Klondex – Hollister Underground Mine	173	0	173
10	Newmont – Bootstrap Mine	1,900	0	1,900
14	Newmont – Blue Star/Genesis, Section 36, Deep Star, Lantern, North Lantern, Bullion Monarch, Green Lantern	4,739	1,000	5,739
13	Newmont – North Area Leach	1,526	0	1,526
18	Newmont – Carlin Mine/Millsite, Pete Mines (open pit and underground), Crow, Castle Reef, and Perry	3,673	1,000	4,673
16	Newmont – Leeville Underground Mine	585	0	585
20	Newmont – Mike Mine	0	100	100
19	Newmont – Gold Quarry/South Operations Area Project, Maggie Creek Reservoir, N-S Haul Road	9,961	1,000	10,961
22	Newmont – Rain Mine[4]	961	100	1,061
23	Newmont – Emigrant Mine[4]	1,418	0	1,418
25	Halliburton – Heavy Spar Mine	0	1,000	1,000
26	PCI/NOV – Coyote	4	0	4
	Other Sand and Gravel Operations	395	0	395
	Subtotal	**38,390**	**5,367**	**43,741**
Exploration Projects[3]				
1	Klondex – Hollister Exploration	50	0	50
4	Trio Gold Corp – Rodeo Creek	42	0	42
5	Barrick – Rossi	51	0	51
8	Barrick – Dee	84	0	84
9	Barrick – Ren	60	0	60
11	Barrick – Goldstrike	233	0	233

Table 3.2-1. Mine and Mineral Surface Disturbance Associated with Past, Present, and RFFAs

Map Reference No. (Figure 3.2-2)	Action (Applicant – Project)	Past and Present Disturbance (Acres)	RFFA Projected Disturbance (Acres)[1]	Total Approved/ Projected Disturbance (Acres)[1]
12	Newmont – Pearl Exploration	20	0	20
18	Newmont – Carlin	255	0	255
15	Newmont – Chevas	168	0	168
17	Newmont – High Desert	164	0	164
20	Newmont – Mike	48	0	48
21	Newmont – Woodruff Creek[4]	66	0	66
23	Newmont – Emigrant Springs[4]	155	0	155
24	Royal Standard Minerals – Pinon Railroad Project[4]	20	200	220
	Subtotal	**1,416**	**200**	**1,616**
	Total	**39,806**	**5,567**	**45,357***

Sources: BLM 2015f; BLM 2012a; BLM 2012b.

[1] Approximate acreages.
[2] Storm Mine surface disturbance of 195 acres incorporated into Arturo Mine disturbance.
[3] PoO level exploration programs >5 acres of surface disturbance.
[4] Located within the CESA for socioeconomic and recreation/wilderness resources only.

*Includes some overlapping facility acreages (approximately 16 acres)

Halliburton Energy Services (HES) Rossi Mine

The Rossi Mine occurs in the Santa Renia Fields area in the Bootstrap Mining District. Barite mining began in 1947 and continues under the current operator, HES. Facilities include open pits, WRDFs, haul roads, ore stockpiles, jig plant, ponds, and various support and ancillary facilities. No dewatering is associated with the Rossi Mine. A PoO was submitted to the BLM in August 2014 to expand operations for an additional 8 years.

Barrick Goldstrike Mines Inc. (BGMI) Goldstrike/Betze Mine

The BGMI facility is located approximately 5 air miles to the south and east of the Rossi Mine within the Lynn Creek Mining District. BGMI's operation is known as the Goldstrike or Betze Mine Project. It includes the Betze Pit, Meikle and Rodeo underground mines, processing facilities, WRDFs, tailings disposal facilities, and ancillary support facilities. Western States Minerals initiated mining in the area of the Betze-Post Mine in 1986. BGMI acquired the mine in 1988, expanded operations, and has continued mining to the present. Current disturbances are associated with the roads, reclaimed leach pad, mill and processing facilities, and ancillary support facilities. BGMI's Betze Pit Expansion Project, approved by the BLM in 2009, consists of the expansion of the open pit, construction of the Clydesdale WRDF and construction of a new tailings disposal facility. The ore processing life of the Betze Pit Expansion Project is expected to extend 19 years. BGMI dewatering operations discharges into the Boulder Valley. The dewatering operations are monitored and reported to agencies under the approved Boulder Valley Monitoring Plan.

Dee Gold Mine

The Dee deposit was discovered in 1981 and began production in 1984 under the operating partnership of the Dee Gold Mining Company and Rayrock Mines Inc. Glamis Gold Ltd. became the operator of the Dee open pit mine in 1999 and initiated underground production from the Dee Deep North deposit that same year. Both the open pit and underground mines were shut down in 2000. Reclamation and closure activities were subsequently completed for most of the Dee Gold Mine facilities by 2009. The surface disturbance associated with this project (812 acres) was incorporated into the Arturo Mine Project, except for 83 acres associated with tailings impoundment #2. Tailings impoundment #2 was reclaimed in 2004.

Arturo Mine

The Arturo Mine Project, an expansion of the mine formerly referred to as the Dee Gold Mine, is located immediately to the south of the Rossi Mine and is approved for a total surface disturbance of 2,774 acres. At the time of approval for the Arturo Mine Project in May 2014, the Dee Mine was in closure and final reclamation status. The Arturo Project includes the expansion of the existing open pit, construction of two WRDFs (East and West WRDF), construction of a new heap leach pad (No. 12) and associated processing facilities. The Arturo Mine Project EIS describes the mine sequence and operations. The total Arturo project life is 14 years, including 8 years for mining activity, 2 additional years for ore processing, and 4 years of active reclamation. Underground mining at the El Nino Project, located within the east pit of the Arturo Mine, began in 2015. No additional surface disturbance is added to the Arturo Mine Project as the El Nino Project is located entirely on existing disturbance.

Storm Underground Mine

The Storm Underground Mine is located within the existing Dee open pit. The Storm decline was developed from the lowest level of the Dee open pit in March 1999 to explore ore bodies and identify potential gold-bearing ore reserves on the Barrick-Meridian joint-venture. The Storm Underground Mine began commercial production in April 2007 and ended mining operations in 2012. The mine is currently in closure. The 195 acres of surface disturbance associated with the Storm Underground Mine has been incorporated into the Arturo Mine Project.

Ivanhoe Mining District Mines

The Ivanhoe Mining District is located at the north end of the Carlin Trend, approximately 9 air miles northwest of the proposed project. Exploration and mining activities have been conducted in the Ivanhoe Mining District over the past 100 years, with the majority of activity occurring from 1980 to the present. The district has been actively explored for mercury, molybdenum, uranium, and gold. Several companies, including U.S. Steel Corporation, Touchstone Resources Corporation, Newmont Exploration Ltd., Rodeo Creek Gold (RCG), Great Basin Gold Inc., Waterton Global Mining, and Carlin Resources have recently been involved with gold exploration. Recent past and present activities in the Ivanhoe Mining District are presented below.

- The Ivanhoe Mine, also known as the Hollister open pit mine, is an open pit operation undergoing reclamation and closure. The Ivanhoe/Hollister open pit mine began operations in 1990 and ended mining in 1991. The mining of the Ivanhoe/Hollister open pit was operated by Touchstone Resources. Newmont acquired the property in 1992 after mining was completed and began reclamation. A portion (44 acres) of the total surface disturbance (224 acres) has been incorporated into the Hollister Underground Mine Project.
- The Hollister Underground Mine Project – This underground mine was the next phase of expansion of the Hollister Development Block Project, an underground exploration project that began in 2004 by Hecla Ventures (BLM 2004, BLM 2007a, BLM 2007b). RCG acquired Hecla's interest in 2008, initiated the Hollister Underground Mine Project, and the project and mine was later acquired by Waterton Global Mining in 2013. Waterton's Hollister Underground Mine Project, approved by the BLM in 2014, included the expansion of surface and underground exploration activities, transition to full-scale underground mining and production of gold and silver, waste rock disposal, and development of ancillary support facilities. Carlin Resources, a subsidiary of

Waterton Global Mining, was the operator of the project. In 2016, Klondex Mines Inc. purchased the company Carlin Resources and now operates the Hollister Underground Mine Project under the company name Klondex Hollister Mine Inc.

North Operations Area

Newmont's North Operation Area includes all of Newmont's mining operations located between (and inclusive of) the Bootstrap Mine to the north and the Pete Mine to the south. A summary of past and present actions within Newmont's North Operations Area is provided as follows.

- The Bootstrap Mine is located approximately 2.5 miles south of the proposed project area between the Arturo Mine and Goldstrike Mine along the Bootstrap Haul Road. Mining operations at the Bootstrap open pit occurred from 1974 to 1984. Closure and reclamation were completed at the mine in 1988. Mining operations at the Bootstrap Mine were reinitiated by Newmont in 1996 with the development of the Bootstrap, Capstone, and Tara gold deposits. In 2000, mining operations ceased and Newmont reclaimed most of the surface disturbance including backfilling, recontouring, and seeding the Capstone open pit by 2005.
- The Blue Star/Genesis asset was acquired by Newmont in 1968 and open pit mining on public lands began in 1988 with BLM approval of the Plan of Operations. In 1995, Newmont began mining the Deep Star underground deposit at the Blue Star/Genesis open pit. In 2010, expansion of the Genesis Project was approved, extending the mine life for an additional 12 years. The Genesis Project includes expansion of the Genesis open pit and backfilling several of the existing open pits with waste rock material. The Green Lantern portion of this project is estimated to have an RFFA of 1,000 acres of surface disturbance. Currently, Newmont has placed the Green Lantern on hold.
- In 1988, Newmont constructed and began operation of the North Area Leach Facility and Mill No. 4. The North Area Leach Facility is utilized by Newmont to process leach grade ores from the North Operations Area. The life of the North Area Leach Facility was extended with the extension of Blue Star/Genesis open pit. In 2006, Mill No. 4 facilities were decommissioned and the disturbed area was transferred to BGMI from Newmont and the disturbance has been incorporated into the Betze/Goldstrike Mine Project.
- The Carlin Mine was the first modern day gold mine to be developed on the Carlin Trend. The Carlin Mine was discovered in 1962 and operations began in 1965 as an open pit mining and milling operation. The Carlin Mine facilities include open pit and underground mines, WRDFs, haul roads, the closed Mill 1 site, a tailings disposal facility, and surface exploration. The Carlin Mill 1 was constructed in 1965 and operated until 1994. Mill 1 was fully decommissioned in 1998 leaving the office and shop buildings on the site. The office and shop buildings were fully decommissioned in 2011. Underground mining at the Carlin Mine began in 1995 and continues to date. The Pete Project was initiated in 2003. The Pete Project consists of two separate open pits (Pete and Crow open pits), haul roads, and the Pete WRDF. A portion of the Pete WRDF is in reclamation status. The Crow open pit was backfilled and reclaimed (38 acres). Underground mining (Bajo Project) began in the bottom of the Pete Pit in 2010 at the end of the Pete open pit operation. The Bajo Project includes ancillary facilities for the underground operation, including office buildings and other support facilities. The Pete open pit is being partially backfilled by the underground operation. The Pete WRDF was reclaimed concurrently during the mining operation and the final reclamation began in 2010 and final reclamation was completed in 2011. Mining continues in the Carlin Pit with the waste rock material being utilized to partially backfill parts of the pit. The Castle Reef open pit is approved for mining but has not yet been mined. The Perry open pit mine is a projected RFFA of 1,000 acres of surface disturbance. Newmont has placed the Perry Project on hold until 2018–2019. Reclamation activities are projected to continue until at least 2027.
- Newmont's Leeville Project, in the center of the North Operations Area, began mine development and operations in 2002 with a project mine life of 18 years. This underground gold mine is located approximately 10 miles southeast of the project area. Major project components include the underground mine with one hoist and one ventilation shaft and underground access; the mine

dewatering system, including a water treatment facility and pipeline system to convey groundwater from the Leeville Mine to BGMI's water management facility; a WRDF; access and haul roads; shipment of ore to Newmont's Mill 6 facility in the South Operations Area; and ancillary support facilities.

South Operations Area

In 1969, Newmont discovered gold in their South Operations Area located approximately 6 miles northwest of the I-80 corridor. Open pit mining began in 1981 and has expanded periodically. The South Operations Area includes the Gold Quarry, Mac, and Tusc open pits; Chukar underground mine; mine dewatering, water treatment, and water management system; WRDFs; tailings disposal facilities; and ancillary facilities. Newmont began underground mining at Chukar in 1995. Newmont continues to mine at Gold Quarry by both open pit and underground methods.

Rain Mine

Newmont acquired the Rain claims in the Carlin Trend south of the I-80 corridor in 1979 and conducted exploratory drilling in the early 1980s to define the gold reserves. These deposits, located approximately 42 miles from the project area, consist mainly of Emigrant, Gnome, Snow Peak, Southern Mineralized Zone, Rain Extension, Tess, NW Tess, and Saddle. Mining operations were initiated at the Rain property in 1987. Mining operations consisted of open pit and underground mining, waste rock disposal, ore processing, a tailings disposal facility, heap leaching facility, and ancillary facilities. Open pit mining at Rain continued through 1999. Rain underground operations began in 1996 and continued through 1998. Mining activity has ceased and the Rain Mine is currently undergoing reclamation and closure. Projected RFFA proposed disturbance is 100 acres for closure activities.

Emigrant Mine

Newmont's Emigrant open pit mine is located within 1 mile of the Rain Mine. BLM approved the Emigrant Mine Project in January 2011, which includes plans for an open pit mine, a WRDF, a run-of-mine heap leach pad, and ancillary support facilities. The Emigrant Mine has an estimated operational life of 10 years for mining and 4 additional years of active leaching until 2025.

Sand and Gravel Mining Operations

Sand and gravel mining operations also operate in the Carlin Trend in support of construction and maintenance of area roads and highways. Approximately 395 acres of private land have been disturbed by sand and gravel mining in the Carlin Trend area.

3.2.1.2 Mineral Exploration

Exploration activities within the Carlin Trend include access road and drill pad construction, drilling, and trenching resulting in isolated areas of land disturbance. Exploration operations that disturb more than 5 acres of land surface require a PoO and are included in **Table 3.2-1**. Additionally, smaller exploration programs that require under 5 acres of surface disturbance (notice-level projects) occur in the Carlin Trend. Notice-level exploration programs expire every 2 years unless extended. Notices are officially closed once reclamation is complete.

3.2.1.3 Mine Dewatering and Discharge

The proposed Rossi Mine Expansion Project does not require mine dewatering as it is located in the drawdown area resulting from the dewatering at Barrick's Goldstrike Mine; however, dewatering to facilitate other mining operations in the Carlin Trend has been ongoing in the vicinity for approximately 20 years. As mines have advanced to deeper levels, pump systems, dewatering wells, and associated discharge systems have been installed to lower the groundwater inflow to open pits and underground workings. BLM has evaluated dewatering and discharge activities in the Carlin Trend in recent documents that include EISs and specific cumulative analyses. BLM documents that provide detail on past and present mine dewatering and discharge activities related to the proposed project include the Cumulative

Impact Analysis of Dewatering and Water Management Operations for the Betze Project, South Operations Area Project Amendment, and Leeville Project (BLM 2000b); the Betze Pit Expansion Project, Final Supplemental EIS (BLM 2009), the South Operations Area Project Amendment Cumulative Effects, Final Supplemental EIS (BLM 2010b), and the Leeville Project, Final Supplemental EIS (BLM 2010c). Past and present mine dewatering and discharge activities are presented below.

- Maggie Creek Basin – Dewatering and discharge activities in the Maggie Creek Basin result from Newmont's South Operations Area mining operation. The South Operations Area mitigation plan currently is in place to address potential adverse impacts from dewatering. The Gold Quarry Mine currently pumps water at a rate of approximately 14,000 gpm for use in mine operations, occasional storage in Maggie Creek Reservoir, irrigation, and discharge directly to Maggie Creek and ultimately the Humboldt River.
- Boulder Flat Basin – Dewatering in the Boulder Creek area includes activities at BGMI's Betze Pit and underground Meikle Mine (approximately 14,500 gpm). Dewatering is managed according to a water management plan for use in mine operations, storage in the TS Ranch reservoir, irrigation, the Boulder Valley reinjection system, the Sand Dune drainage and evaporation network, and discharge to the Humboldt River.
- Newmont's Leeville Project dewaters approximately 13,400 gpm for use in mine operations; the excess water is discharged into a pipe that is connected to BGMI's dewatering system, which is incorporated into BGMI's dewatering program and utilized or discharged accordingly.
- The Hollister Underground Mine Project has been permitted to pump water collected via gravity, drainage, and seepage in the underground decline. Groundwater entering the exploration decline (up to a maximum of 1,100 gpm) is pumped to the surface and into a recycle pond for storage, reuse and infiltration into alluvium near the confluence of Little Antelope Creek and Antelope Creek.

The static pre-BGMI dewatering program elevation within the northern Carlin Trend was observed to be approximately 5,276 feet amsl. The target dewatering elevation for the Goldstrike Mine was 3,576 feet amsl was reached in 2000 (BLM 2012a). The groundwater drawdown at the proposed Rossi Mine project area is estimated to range from approximately 300 feet near the south margin of the proposed PoO boundary to less than 10 feet in the central and northern portion of the proposed project area (BGMI 2015). Under these estimates current groundwater levels within the Rossi Mine project area are estimated to range from approximately 5,266 feet amsl and 4,976 feet amsl. Groundwater levels in the proposed project area are expected to begin recovery when BGMI's dewatering program ceases at the end of mine life (estimated to occur in late 2021) (Schafer Limited LLC 2012).

3.2.1.4 Ore Processing

Newmont and BGMI operate refractory ore processing mills at the Gold Quarry Mine and the BGMI facility, respectively. In refractory ore processing, heat is used to facilitate gold recovery by liberating sulfide minerals from refractory or sulfidic ore. Gold is then recovered by using standard cyanide extraction method (BLM 2010c).

3.2.1.5 Grazing and Agriculture

Livestock grazing has been one of the main land uses over many decades in the Carlin Trend area. Grazing allotments and/or fenced range exist within and around the project area. The number of animals allowed on allotments is periodically adjusted in response to mine development, drought, wildfires, and availability of stock water. Surface water and groundwater resources are used to support livestock grazing and production of alfalfa and native grass hay production (BLM 2010c).

3.2.1.6 Oil, Gas, and Geothermal Leasing

Elko District competitive oil and gas lease sales are conducted annually. Lease areas are designated based on a nomination process involving interested parties. Once parcels of land have been nominated to the BLM state office for lease, the land parcel is placed on a competitive auction list for sale. Parcels located within the Carlin Trend or within the Elko District may be included on the list, however this is not

known until the sale is scheduled. Until the sale is completed, it is not known as to whether or not any parcels located within the Carlin Trend or Elko District have been leased. Oil and gas leases are issued for a period of 10 years. Energy West Corp has oil and gas leases on 13,241 acres in the CESA. To date, no exploration activity has occurred on these leases.

Leases for geothermal development have also been issued in the Carlin Trend area. Geothermal leases are nominated and placed on a competitive auction list for sale. It is not known where the lease parcels are located until the sale is scheduled. Additionally, it is not known as to whether or not a geothermal lease is issued until the sale is completed and the results are posted. Geothermal leases are issued for a period of 10 years.

3.2.1.7 Utilities

Several ROWs exist and are permitted to various entities. Surface disturbing activities associated with most of the ROW actions pertain to transmission lines and substations, water wells and pipelines, natural gas pipelines, fiber optic lines, communications sites, and access roads. The surface disturbance associated with the existing ROWs varies for each action. ROWs would continue to be issued in the future for activities that are developed, proposed, and required by regulation.

Present utility and community actions resulting in surface disturbance in the CESAs include state, county, and public roads; the North Elko Pipeline, the Eureka Pipeline, the Ruby Pipeline; the TS Power Plant; Tuscarora Geothermal Power Plant; and development primarily associated with the communities of Carlin, Elko, Spring Creek, and Battle Mountain.

The North Elko Pipeline Project was completed in December 2013 and involved the construction and installation of a buried natural gas pipeline. This 24.2-mile, 12-inch-diameter pipeline connects to the Ruby Pipeline and runs south to the BGMI facility and created approximately 140 acres of surface disturbance.

The Eureka Pipeline, an 18-mile, 12-inch-diameter buried natural gas pipeline, was recently completed. This pipeline was installed within a 100-foot construction ROW resulting in a final 30-foot permanent ROW after reclamation. The Eureka Pipeline delivers natural gas from the North Elko Pipeline to Newmont's Leeville and Gold Quarry mines.

The Ruby Pipeline, a 675-mile natural gas pipeline was completed in July 2011 and extends from southwest Wyoming, across Utah, Nevada, and terminates near the California-Oregon border. The pipeline route is located approximately 10 miles north of the Rossi Mine and was constructed within a 115-foot-wide corridor.

The TS Power Plant, transmission lines, and associated facilities are located 3 miles north of Dunphy and approximately 27 miles south of the Rossi Mine in Eureka County, Nevada. The TS Power Plant is owned by Newmont's subsidiary Newmont Nevada Energy Investment, LLC. This 242-megawatt capacity coal-fired power plant became operational in June 2008 and provides power for Newmont's mining operations throughout northeast Nevada. Excess annual capacity is made available to the NV Energy Power Company. Approximately 600 acres of surface disturbance are associated with the TS Power Plant (BLM 2014a).

Ormat Technologies, Inc. constructed the Tuscarora Geothermal Power Plant in Elko, Nevada north of Tuscarora, Nevada in 2012. The total surface disturbance for the power plant, access road, and power transmission line, is approximately 170 acres.

Surface disturbance has occurred within the Carlin Trend due to transmission line upgrades and ROWs that support ongoing mining activities and municipalities in Nevada, Idaho, and California. Although there are designated ROWs associated with transmission lines, the associated surface disturbance typically is minimal (e.g., restricted to the pole locations and maintenance access, as needed). A 345-kilovolt transmission line north of the proposed project transmits electricity from the Valmy Power plant to the Coyote substation and eventually supplies power to the states of Idaho and California.

3.2.1.8 Fuel Reduction Program (Wildfire Prevention)

The BLM has a vegetation treatment program that reduces vegetation for wildfire suppression purposes. Fuel reduction programs within the Elko District consist of creating fuel (vegetation) breaks to help manage wildfires. Fuel breaks are changes in vegetation height and/or type. Fuel breaks may include, but are not limited to, mowing vegetation, planting greenstrips, controlled burns, and treatment of noxious weeds or non-native invasive plant species. Greenstrips are vegetation planted in strips with species that are more fire resistant because they stay greener longer during the dry summer months.

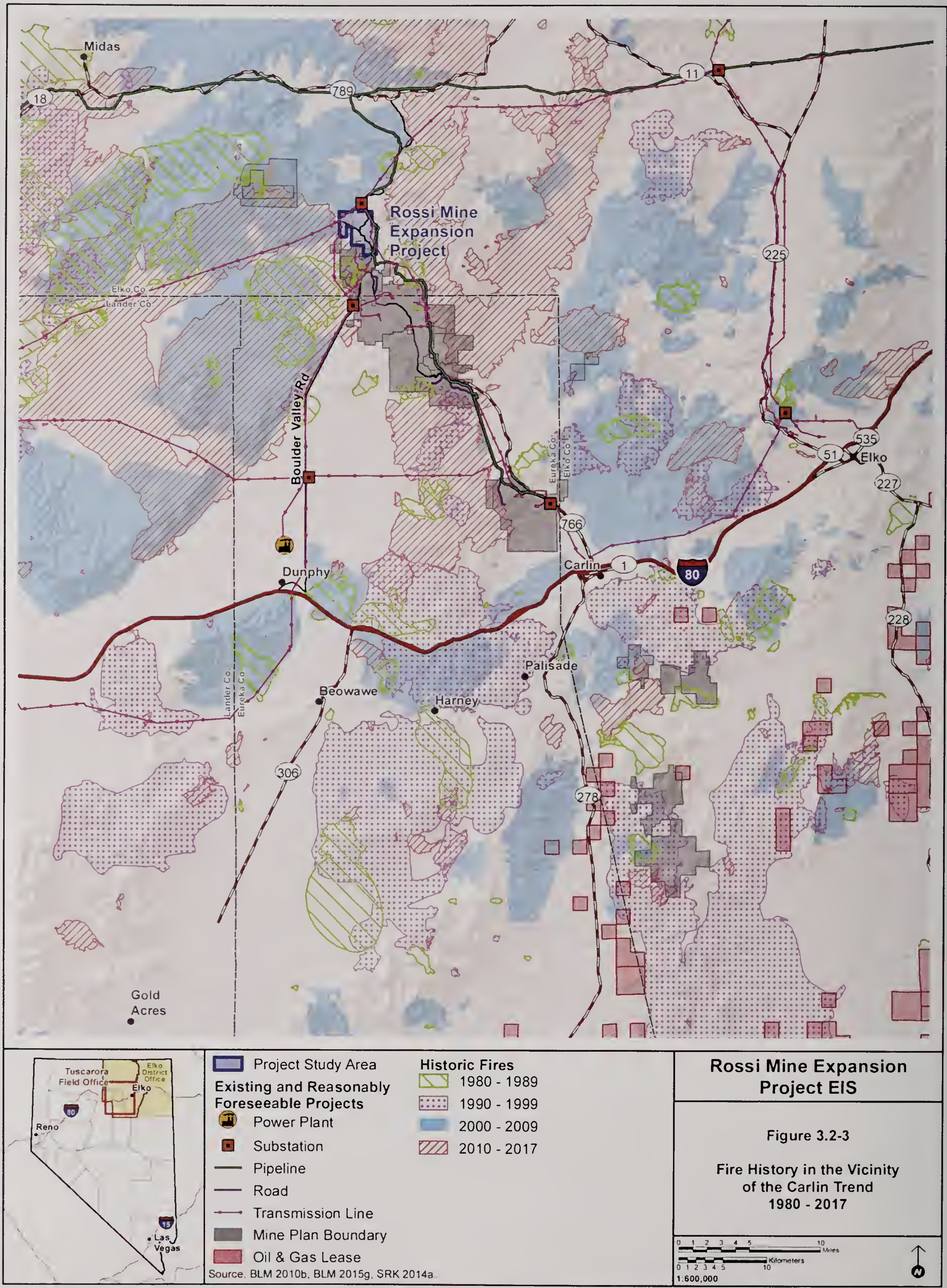
Fuel reduction is used around communities to help reduce damage to property from wildfires, create mosaic vegetation patterns for wildlife habitat, create varying vegetation age classes in vegetation communities in an attempt to prevent catastrophic wildfires, remove diseased vegetation, and attempt to eliminate noxious weeds or non-native invasive plant species such as cheatgrass.

3.2.1.9 Wildfires

Figure 3.2-3 illustrates the fire history in the vicinity of the Carlin Trend between 1980 and to July 2017. Approximately 50.1 percent (1,476,738 acres) of the 2,947,000 acres shown in **Figure 3.2-3** were impacted by fire during the past 37 years. The 2017 fire season was particularly notable with the Rooster Comb fire that burned approximately 202,856 acres northeast of Battle Mountain including a portion of the Rossi Mine study area (**Figure 3.2-3**). Wildfires may be started by lightning or human errors and range in size from less than one acre to large catastrophic fires encompassing hundreds or thousands of acres. Wildfire occurrence, sizes, and locations are unpredictable and may occur on lands within the CESAs any time when conditions are favorable.

3.2.1.10 Wildfire Re-seeding

Figure 3.2-4 illustrates recent BLM re-seeding efforts on the burned areas. Three seed mixes have been used to support rangeland, Hydrographic Basins, and wildlife. Various methods including all-terrain vehicle and harrow, drill seeding with rangeland drill, broadcast seeding with broadcaster, and aerial seeding were used to plant grass, forb, and shrub species. Shrub plants also were planted in the seeded areas to establish a mixed canopy. A total of 341,709 acres were re-seeded with wildlife (250,557 acres), range (130,146 acres), and Hydrographic Basins (14,671 acres) seed mixes, including some overlapping seed mixes, in the area shown in **Figure 3.2-4**. It is anticipated that rehabilitation efforts would be conducted for some of the larger 2017 wildland fires. Rehabilitation activities would consist of seedings utilizing the various methods stated above and fence replacement and repairs.



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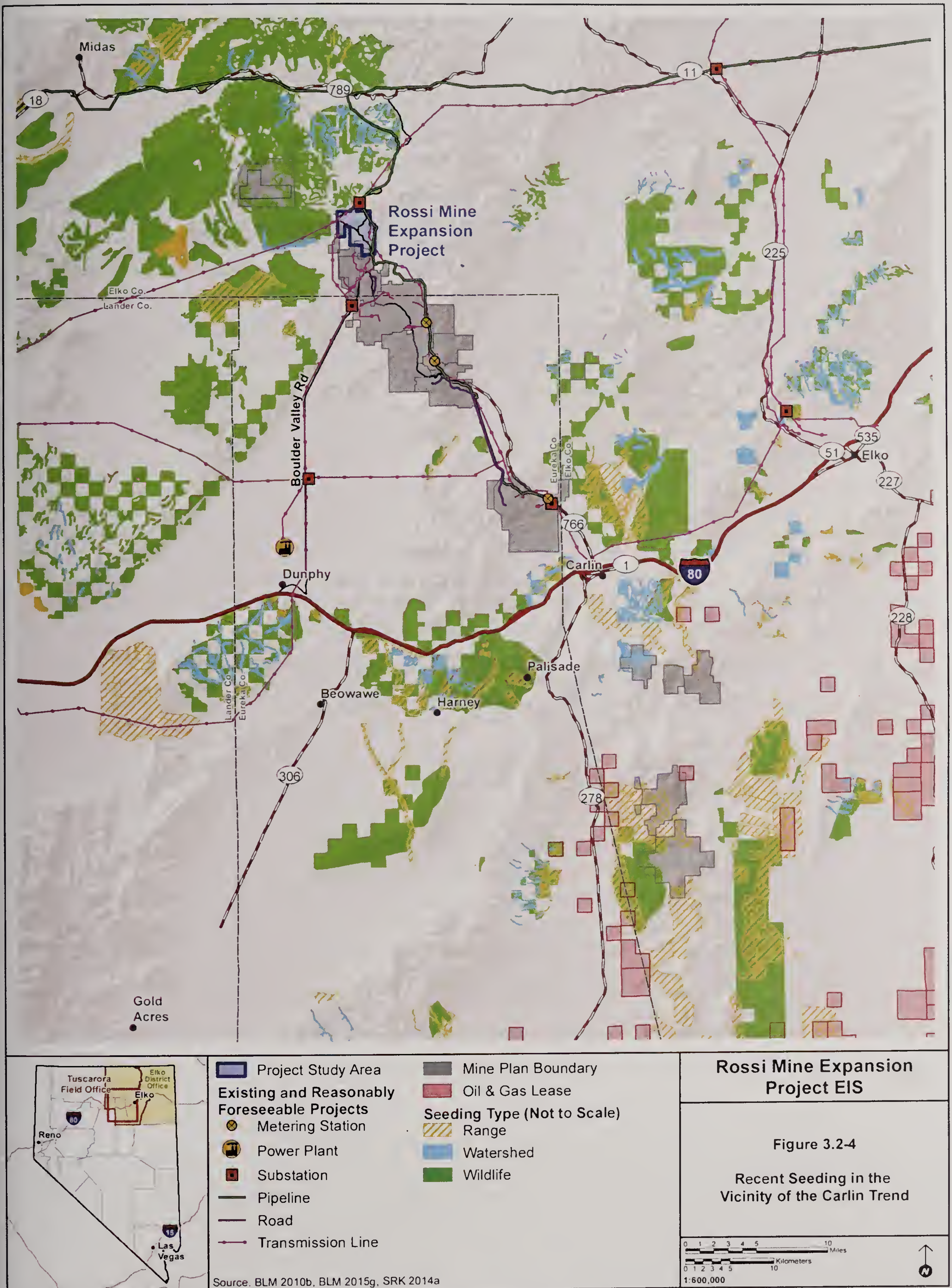

Figure 3.2-4

Recent Seeding in the Vicinity of the Carlin Trend

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3.2.1.11 Range Improvements

Other surface disturbing activities that exist and may be constructed in the future within the CESAs are range improvements. Range improvements include fences and cattleguards; water systems consisting of spring developments, wells, pipelines, troughs, and ponds; and seeding. Fences are linear features that create small amounts of surface disturbance. Surface disturbance associated with water systems varies dependent upon the components of the specific project. Usually the pipelines are buried; therefore, the associated surface disturbance is temporary until the area has revegetated. Temporary exclusion fences may be installed for a few growing seasons while vegetation re-establishes after a wildfire, and then would be removed.

3.2.1.12 Recreation

Recreational use of land in and adjacent to the Carlin Trend includes fishing; hunting (deer, antelope, and upland game birds); sightseeing; cross-country skiing; horse-back riding; rock hounding; canoeing; and off-highway vehicle use. Recreational activities are managed by the BLM, Nevada Division of State Parks, U.S. Department of Agriculture (USDA) – U.S. Forest Service (USFS), USFWS, Bureau of Indian Affairs (BIA), and private owners.

3.2.1.13 Land and Community Development

Surface disturbance associated with residences, commercial development, and the supporting infrastructure exists in the towns of Carlin, Elko, Spring Creek, and Battle Mountain. Approximately 565 acres have been platted for development in the areas between I-80 and the Humboldt River in and adjoining the Town of Carlin. Other development is occurring east of Nevada State Route (SR) 766 near its intersection with I-80. Another 23 acres have been platted at Palisade, midway between Carlin and Dunphy. Development in the Dunphy area consists of approximately 6 acres (Battelle 2001). Additional disturbance associated with these communities has not been quantified.

3.2.1.14 Wildlife Management Programs and Habitat Improvements

Habitat restoration activities in the area include reseeding areas disturbed by mining activities, fire, livestock, or treatments for noxious weeds and non-native invasive plant species; limiting livestock access to riparian areas through strategic fencing and grazing management practices; and general restoration of seeps and springs. These activities are undertaken by both private and public entities. Several restoration projects for wildlife and riparian habitats have been implemented in the Carlin Trend area. Primary projects/programs include the following (BLM 2014a):

- Sheep Creek Range Mule Deer Habitat Improvement Project (709 acres);
- 2009 BGMI Betze Pit Expansion Mitigation Project (acreage unknown);
- 1991 BGMI Betze Project Riparian/Wetland Conservation and Mitigation Fund (acreage unknown);
- BGMI Spring Enhancement Program (acreage unknown);
- 2003 Betze Mitigation Project – Upper Willow Creek Habitat Enhancement (acreage unknown);
- BLM/Nevada Mining Association Beaver Creek Riparian Pasture program;
- Carlin Trend Mule Deer Habitat Management Plan;
- Maggie Creek Watershed Restoration Project – Mitigation Plan for 1993 South Operations Area project;
- Mitigation Plan for 2002 Leeville Project;
- Mitigation Plan for 2002 South Operations Area Project Amendment;
- Mule Deer Transition Range Seeding Project;
- NDOW Industrial Artificial Pond Permit program to prevent wildlife mortality;
- NDOW Mule Deer and Antelope Population Management Programs;

- Open Range Consulting Lahontan Cutthroat Trout Evaluation;
- Susie Creek Riparian Restoration Project;
- T Lazy S Greater Sage-grouse Habitat Improvements;
- Trout Unlimited Strategies for Restoring Native Trout Program; and
- Tuscarora Sagebrush Habitat Restoration Initiative Project.

Several rehabilitation/implementation projects are being planned as a result of the 2017 wildfire season.

3.2.2 Reasonably Foreseeable Future Actions

RFFAs for the Rossi Mine Expansion Project EIS cumulative effects analysis include other projects or actions that potentially impact those resources that would be impacted by the Proposed Action during the same period of time (including final reclamation). RFFAs must also have been determined by the BLM as having a reasonable likelihood of moving forward towards development. RFFAs identified within the boundaries of the various CESAs for the Proposed Action are discussed below.

3.2.2.1 Mine-related Actions

Mining operations (mining, dewatering, ore processing, and reclamation) are expected to continue within the Carlin Trend for the foreseeable future. Estimations of surface disturbance resulting from RFFAs are presented in **Table 3.2-1**.

Mining RFFAs include:

- Halliburton Heavy Spar Mine – development of a barite mine;
- Royal Standard Minerals Pinon Railroad – development of a gold and copper mine project;
- Newmont Gold Quarry – expansion of the Gold Quarry Pit and WRDFs;
- Newmont Mike Mine – development of a gold mine;
- Newmont Blue Star/Genesis – includes the expansion of the Green Lantern Project, which consists of expanding the open pit, and WRDF expansion;
- Newmont Carlin Mine Perry Project – includes the expansion of the Castle Reef open pit and development of the Perry pit and WRDFs; and
- Various Carlin Trend dewatering projects – dewatering of the Carlin Trend has been an ongoing activity for approximately 25 years and is anticipated to continue for the foreseeable future. Mine developments are expected to continue to operate dewatering wells, pumping systems, and discharge systems to ensure groundwater inflow into open pits and underground workings does not occur.

3.2.2.2 Exploration Activities

Exploration drilling, trenching, and road construction at current and proposed mine operations and mineral exploration projects would be expected to continue throughout the Carlin Trend for the foreseeable future. Exploration plans of operations do not expire; they remain active or viable until reclamation is completed. Once reclamation is completed they may be closed if no longer needed by the operator. Notice-level exploration projects (less than 5 acres) are expected to be initiated, completed, reclaimed, and closed according to BLM regulations. Notice-level exploration projects located on BLM managed lands are either completed or extended on a 2-year basis. New RFFA exploration projects being permitted under plans of operations that are located in the Carlin Trend are listed in **Table 3.2-1**.

3.2.2.3 Grazing and Agriculture

Grazing and agriculture operations within the Carlin Trend area are anticipated to continue in the future similar to the past and present levels (BLM 2014a). Range improvement measures can result in surface disturbance and are expected to continue to be implemented in the future in support of grazing management actions.

3.2.2.4 Oil, Gas, and Geothermal Leasing

Activities associated with oil, gas, and geothermal leases within the Carlin Trend area are expected to continue at levels similar to those in past and present timeframe. Energy West Corp has purchased leases in the CESA, but no exploration activities have occurred to date. Based on the assumption of 100 acres of disturbance per each year for 10 years, the potential cumulative disturbance may be at least 100 acres, however, no disturbance has occurred to date.

3.2.2.5 Utilities

Utility development, including the development of road and support infrastructure, is expected to continue in the future at levels similar to those in the past and present timeframe. Utilities also include fiber optic cables, power transmission lines, and natural gas pipelines.

3.2.2.6 Wildfires

Future wildfires are likely to occur in the vicinity of the project area as they have in the past. Prescribed burns and non-native vegetation treatment programs would continue to be used to help reduce fuel loads in selected areas on public lands. The BLM Fuel Management Program (to reduce vegetation and other fuels that could increase risk of wildfire) would continue to be implemented in the area. Re-seeding after wildfires is expected to continue in the future.

3.3 Geology and Minerals

3.3.1 Affected Environment

This section addresses the geology, mineralization, and geologic hazards associated with the proposed Rossi Mine Expansion Project. The geologic conditions discussed below also provide background information for characterizing the hydrogeologic setting and geochemistry provided in Section 3.4, Water Resources and Geochemistry.

The study area for geology and minerals includes the area within the proposed PoO boundary. The CESA for geology and minerals resources includes the northern portion of the Carlin Trend (**Figure 3.3-1**). The Carlin Trend is a 38-mile-long north-northwest alignment of carbonate-hosted gold deposits (Teal and Jackson 2002). The CESA was defined to include the existing and planned mining activities within the northern portion of the Carlin Trend because of the trend of mineralization and the similar type of activities to the Proposed Action that are in close proximity to the project.

3.3.1.1 Physiographic and Topographic Setting

The study area is located in north-central Nevada within the Great Basin section of the Basin and Range physiographic province, characterized by a series of generally north- to northeast-trending mountain ranges separated by broad alluvial filled basins. The mountain ranges in the Basin and Range province are bounded by steep range-front faults where vertical movement on these faults has uplifted the mountain blocks relative to the valleys. Faulting associated with development of the Basin and Range province began approximately 14 million years ago and continues to the present. Continual erosion off the uplifted mountain blocks has resulted in thick accumulations of unconsolidated to poorly consolidated sediments in the valley (or basin) areas. Locally, Boulder Creek basin represents a down-dropped trough between the Sheep Creek Range and the Tuscarora Mountains.

The proposed Rossi Mine Expansion Project site is located along the western flank of the Tuscarora Mountains within the Boulder Creek and Antelope Creek watershed area. Boulder Creek originates in the Tuscarora Mountains and flows to the south into the Humboldt River; Antelope Creek originates in the northwest portion of the Tuscarora Mountains and flows into Rock Creek near the Sheep Creek Range (**Figure 3.4-1**). Elevations in the study area range from approximately 5,200 feet amsl to 6,100 feet amsl.

3.3.1.2 Regional Geologic Setting

The regional geologic conditions are presented in **Figure 3.3-2**. The regional geologic units include Paleozoic bedrock units of the western siliceous and volcanic assemblage and the eastern carbonate assemblage, Cretaceous through Tertiary intrusive rocks, Tertiary sedimentary and tuffaceous sedimentary rocks and Quaternary fanglomerates and alluvial deposits. A general discussion of the geologic history, geologic units, and stratigraphy is presented below.

The region surrounding the study area has a complex geologic history resulting in variable stratigraphic and structural conditions. During the early Paleozoic Era marine clastic and carbonate rocks were deposited in a shallow sea that represented the western continental margin of North America. These marine clastic rocks (referred to as the Western Assemblage) were deposited in the deep water to the west, while carbonate rocks (referred to as the Eastern Assemblage) were deposited in the shallow water to the east (Stewart 1980). The formations associated with the Western Assemblage are predominantly siliceous and very little carbonate, while formations associated with the Eastern Assemblage are predominately carbonate rocks (i.e., limestones and dolomites).

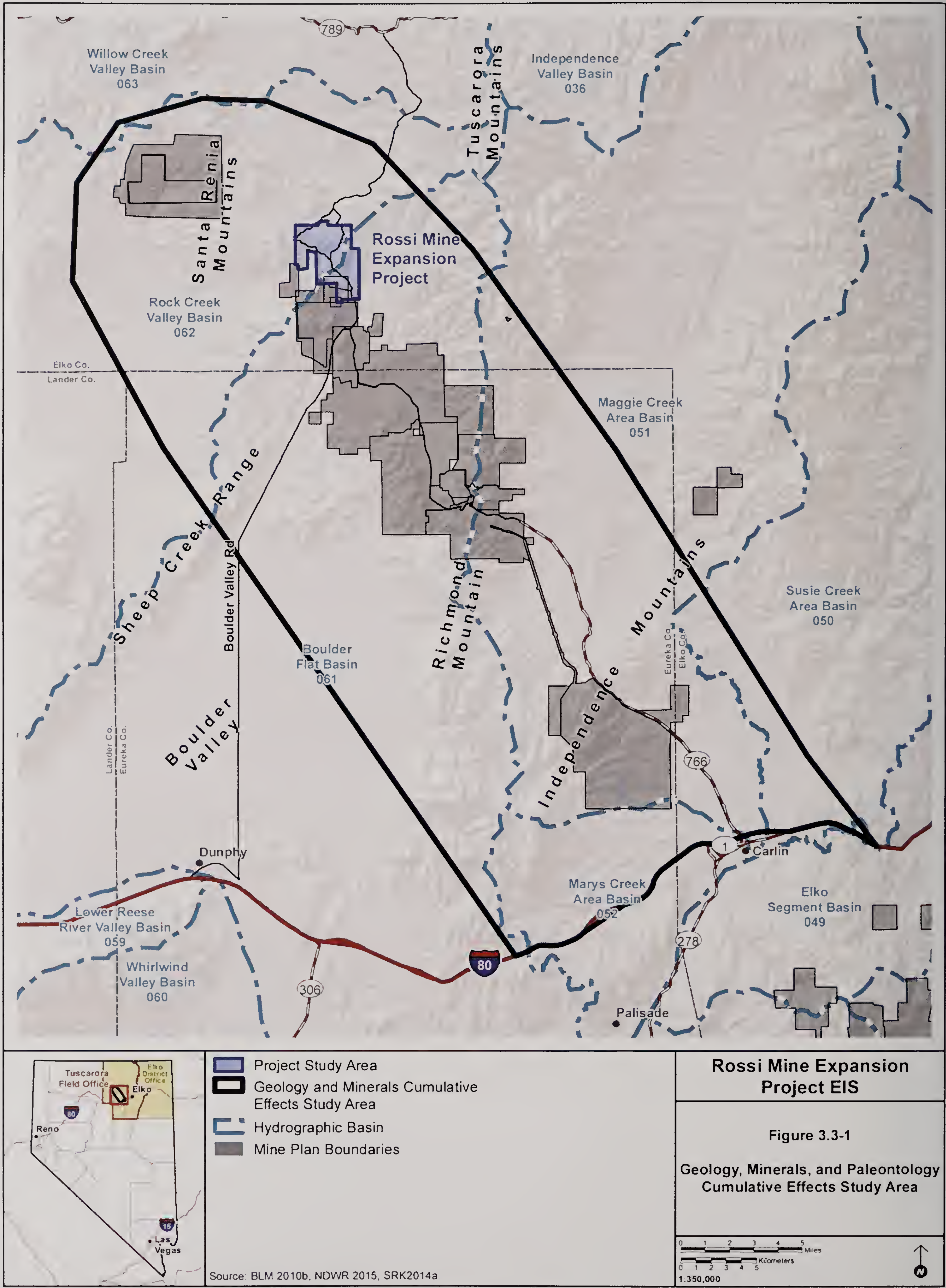

Figure 3.3-1

Geology, Minerals, and Paleontology Cumulative Effects Study Area

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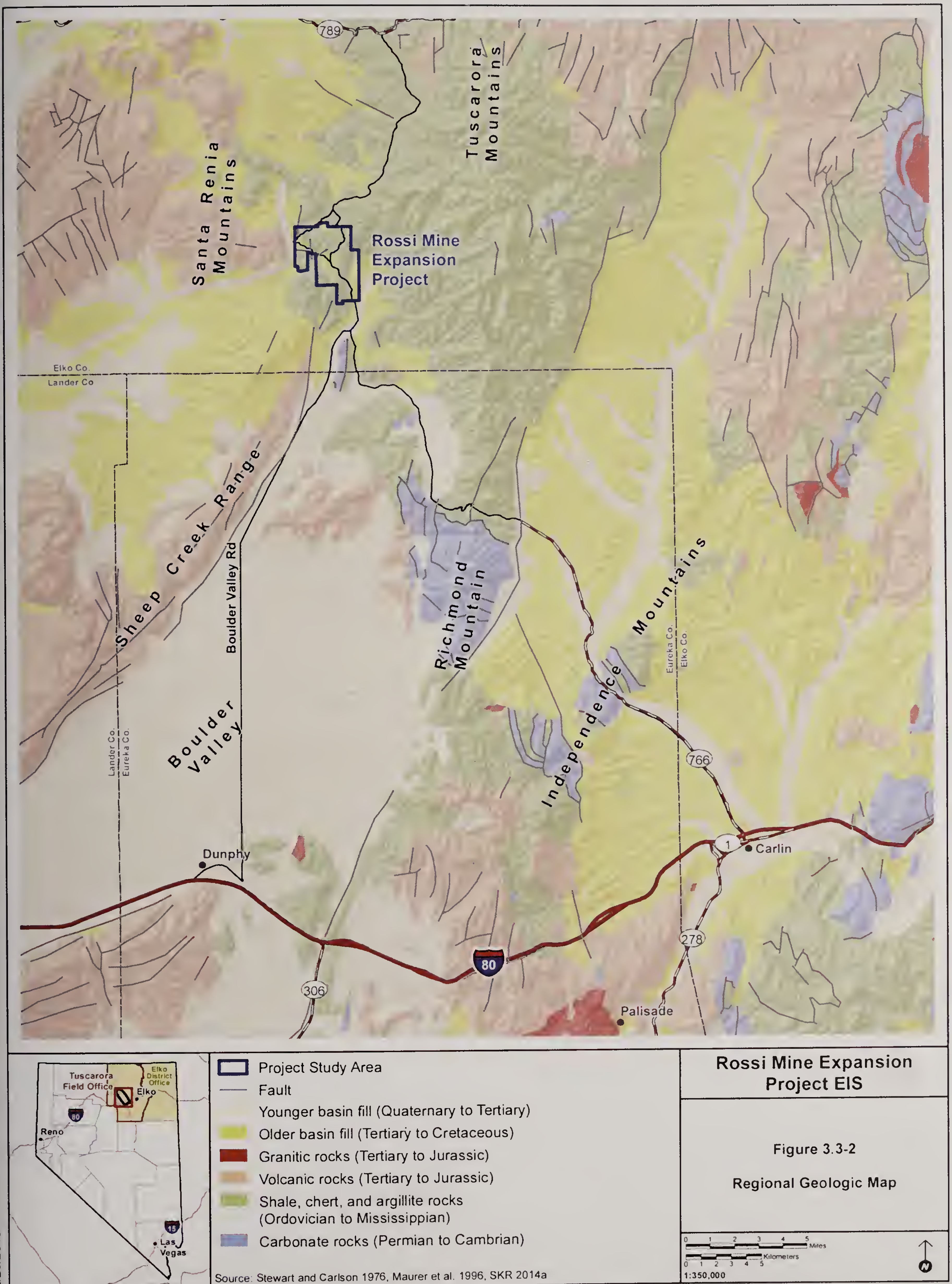


Figure 3.3-2

Regional Geologic Map

2/20/2018

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notice.

During the Late Devonian and Early Mississippian periods, sedimentary deposition was interrupted and the Paleozoic sediments were uplifted, folded, and faulted during a tectonic period geologists refer to as the Antler Orogeny. The Roberts Mountains thrust, a system of low-angle thrust faults that has caused major deformation of the Paleozoic rocks, is the main expression of the Antler orogeny apparent in the region today. Movement along the Roberts Mountains thrust resulted in the displacement of the Western Assemblage up to approximately 90 miles eastward over the Eastern Assemblage (Jory 2002, Stewart 1980). As a result, the Western Assemblage occurs in the upper plate of the thrust, while the Eastern Assemblage occurs in the lower plate of the thrust.

In the area located within two miles of the proposed project boundary, the lower plate (Eastern Assemblage) is exposed in a structural window. The structural window refers to an area where uplift and erosion has removed the upper plate (Western Assemblage) exposing the lower plate (Eastern Assemblage) rocks. The window includes much of the upper drainage areas of Boulder and Antelope creeks on the western slope of the Tuscarora Range and extends generally from the Bootstrap Mine to the Arturo Mine located immediately south of the Rossi Mine.

The northern Carlin Trend contains numerous igneous rocks, mostly as local intrusive stocks and dikes, and rhyolitic lava flows. These include the late Jurassic intrusion of the Goldstrike granodiorite stock, Eocene magmatism consisting of rhyolite and dacite dikes, and Miocene rhyolitic lava flows along the western flank of the Tuscarora Spur. Locally Cretaceous granodiorite and diorite and Tertiary quartz latite dikes have intruded the Paleozoic sedimentary rocks.

During the late Tertiary and Quaternary time continual uplift and erosion of the mountains have continued to partially fill the basins with unconsolidated to poorly consolidated silt, sand, gravel, and boulders. The boundary between the mountains and valley margins are generally covered by coalescing alluvial fan deposits where the center of the valleys are dominated by finer grained alluvium deposited by ephemeral streams and playas (Stewart 1980, Stewart and McKee 1977). Basin-wide erosion and deposition have occurred at variable rates in response to continuing fault movements.

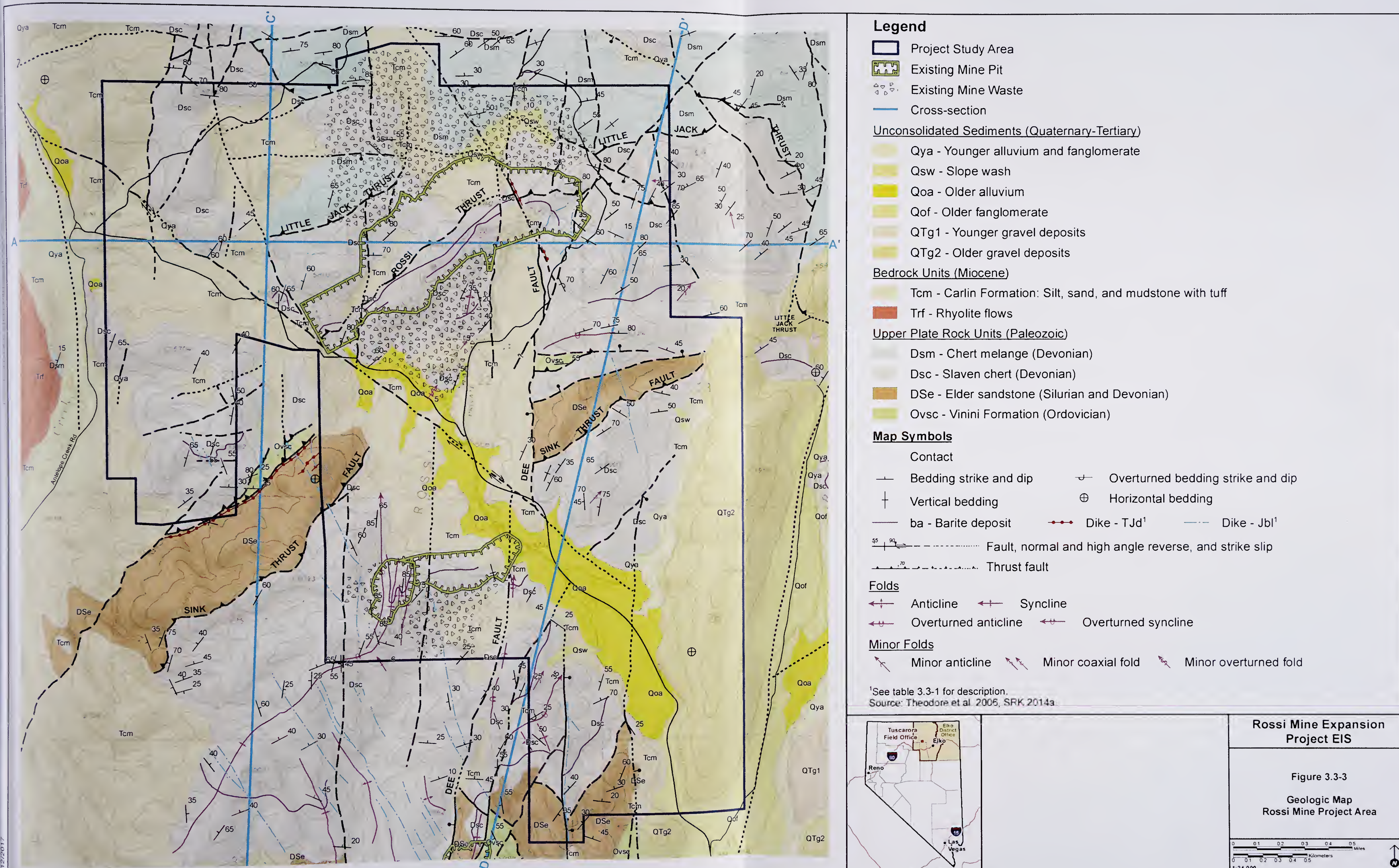
3.3.1.3 Regional Structures

The Roberts Mountains thrust fault is a major regional low-angle fault zone discussed previously in Section 3.3.1.2, Regional Geologic Setting. The fault zone dips gently toward the north throughout the project region.

During the Mesozoic and Early Cenozoic Eras, the project region was subjected to compression that resulted in the development of the Tuscarora Mountain Anticline. Beginning in the late Cenozoic Era, the region was block-faulted by a series of normal and listric faults that created the Basin and Range topography that characterizes the region today. Broad valleys in the region, such as Boulder Valley and the Maggie Creek basin, were formed as down-dropped blocks between uplifted mountain ranges. Major normal faults bound the southeastern flank of Sheep Creek Range, the eastern flank of the Tuscarora Mountains, and the northern side of the Argenta Rim. These normal faults drop the basin side down relative to the mountain side, may have displacement of thousands of feet, and are usually at high angles.

3.3.1.4 Site Geology and Mineralization

The geology of the proposed study area is shown on the geologic map and cross-section provided in **Figure 3.3-3** and **Figure 3.3-4**. A generalized stratigraphic column of the site is presented in **Table 3.3-1**. The following geologic description of the proposed project area is based on the information provided in Theodore et al. (Theodore et al. 2006) and summary provided in SRK 2014 (SRK 2014b).



Rossi Mine Expansion Project EIS

Figure 3.3-3

Geologic Map
Rossi Mine Project Area

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Original data were compiled from various sources. This information may not meet National Map Accuracy Standards.
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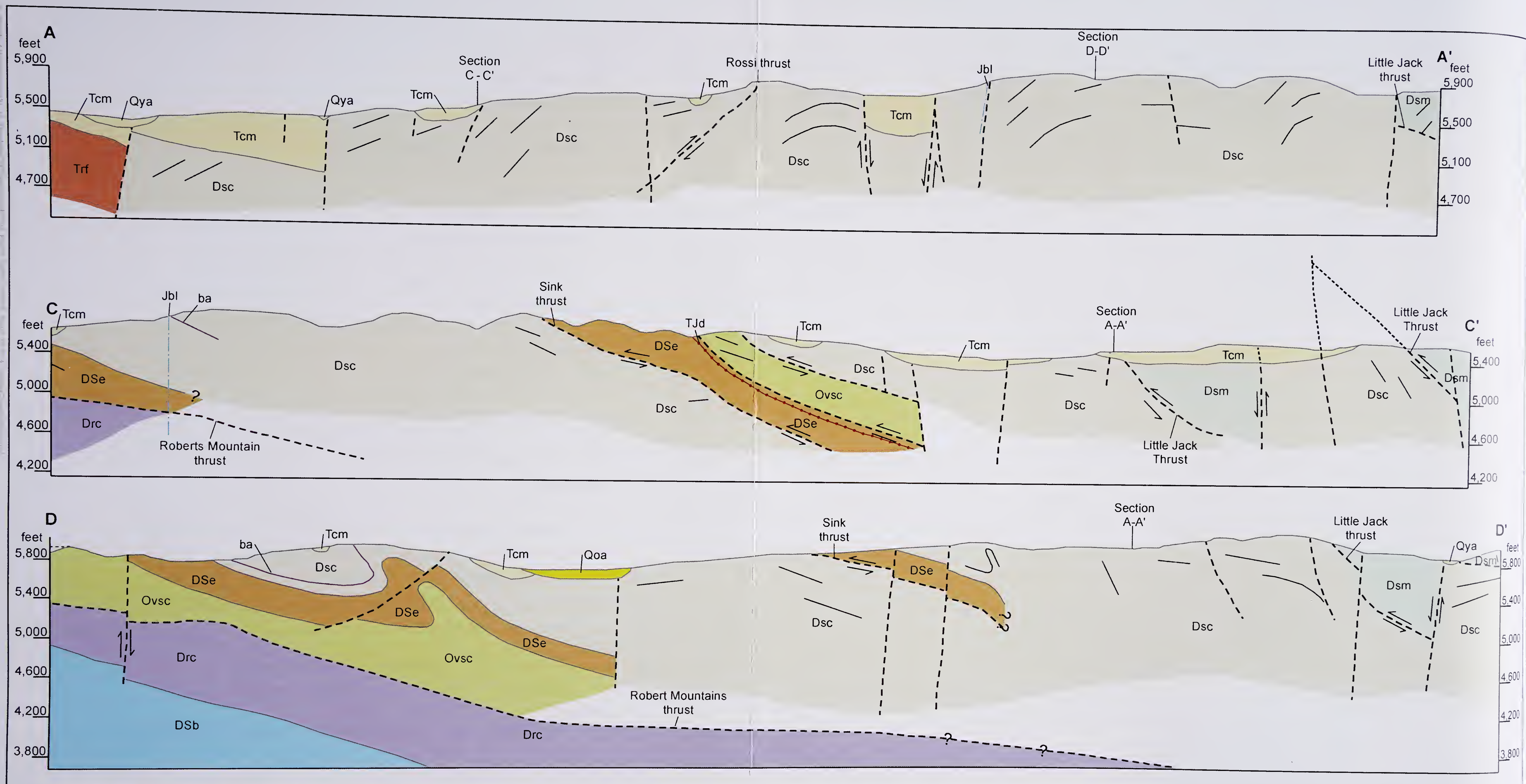
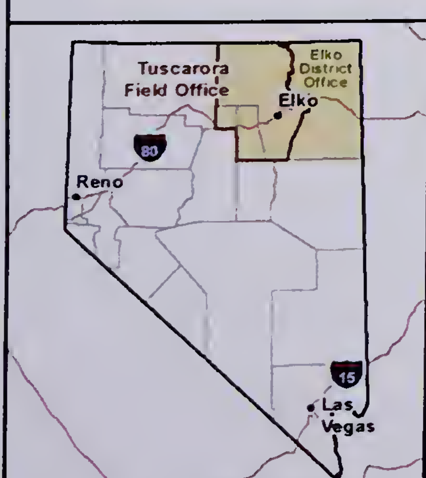
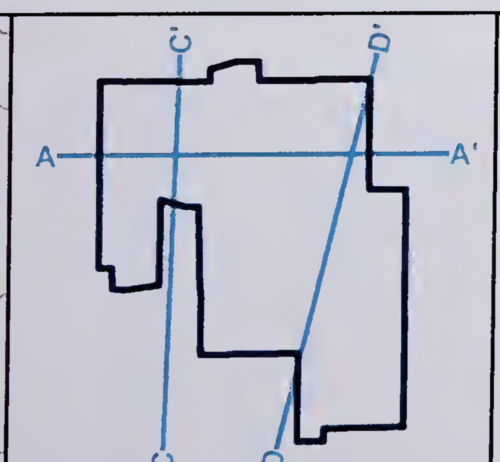






Geologic Units

Unconsolidated Sediments (Quaternary-Tertiary)
- Qya - Younger alluvium and fanglomerate
- Qoa - Older alluvium
- QTg1 - Younger gravel deposits

Bedrock Units (Miocene)
- Tcm - Carlin Formation: Silt, sand, and mudstone with tuff
- Trf - Rhyolite flows

Upper Plate Rock Units (Paleozoic)
- Dsm - Chert melange (Devonian)
- Ovsc - Vinini Formation (Ordovician)
- Dsc - Slaven chert (Devonian)
- DSe - Elder sandstone (Silurian and Devonian)

Lower Plate Rock Units (Paleozoic)
- DSb - Bootstrap limestone
- Drc - Rodeo Creek (Chert subunit)

[1]See table 3.3-1 for description.
Source: Theodore et al. 2006.

Map Symbols
- Contact
- Fault
- ba - Barite Deposit
- Dike - Jbl[1]
- Dike - TJd[1]

Rossi Mine Expansion Project EIS

Figure 3.3-4

Geologic Cross-Sections
Rossi Mine Project Area

10/12/2017

Table 3.3-1. Stratigraphic Column

Structural Assemblage	Age	Map Unit	Unit	Description
	Quaternary	Qya	**Younger Alluvium**	Unconsolidated sand and gravel associated with active and intermittent streams.
		Qsw	**Slope Wash**	Includes talus and landslide deposits.
		Qoa	**Older Alluvium**	Unconsolidated gravel and sand along flanks of major drainages.
		Qof	**Older Fanglomerate**	Unconsolidated boulder and cobble deposits along Boulder Creek.
	Quaternary and Tertiary	QTg1	**Younger Gravel Deposits**	Cobbles and boulders of quartzarenite and chert.
		QTg$_2$	**Older Gravel Deposits**	Cobbles and boulders of quartzarenite deposited in paleo-fanglomerate.
	Tertiary	Tcm	**Carlin Formation**	Silt, sand, and mudstone deposits with abundant well laminated white tuff.
		Trf	**Rhyolite Flows**	Flow banded, porphyritic rhyolite.
	Tertiary or Jurassic	TJd	**Altered Diorite Dikes**	Iron-oxide stained felsic fine-grained diorite dikes.
	Jurassic	Jbl	**Biotite Lamprophyre Dike**	Fine-grained, 3-10 feet wide dales with abundant (up to 50 percent) biotite.
UPPER PLATE (of Roberts Mountains Thrust)	Devonian	Dsm	**Undivided Chert Melange Unit of Slaven Chert**	Ridge-forming, unit consisting of chaotic depositional and intensely deformed tectonic breccia.
		Dsc	**Slaven Chert**	Ridge-forming sequence of thinly bedded, variably colored strata of chert with mostly 1-2 inch between parting surfaces. Shale comprises less than 5 percent of sequence. Locally contains sedimentary barite beds.
	Devonian and Silurian	DSe	**Elder Sandstone**	Slope forming, calcareous fine-grained sandstone and siltstone with shale.
	Ordovician	Ovsc	**Vinini Formation**	Slope forming, mostly dark gray shale and chert with argillite
Roberts Mountains Thrust				
LOWER PLATE (of Roberts Mountains Thrust)	Devonian	Drc	**Rodeo Creek (Chert subunit)**	Black, well-bedded, chert with siliceous mudstone and chert.
	Devonian and Silurian	DSb	**Bootstrap Limestone**	Massive gray carbonate rock.

Source: Derived from Theodore et al. 2006.

Lower Plate Rocks

Rock units that occur in the lower plate of the Roberts Mountains thrust fault are not exposed at the surface but are projected to occur at depth beneath the site as illustrated on geologic cross-sections C-C', and D-D' (**Figure 3.3-4**).

Bootstrap Limestone (DSb). The oldest formation within the lower plate recognized in the study area is the Bootstrap limestone (Silurian and Ordovician), which consists of massive gray carbonate rocks. The Bootstrap limestone is an oolitic, fossiliferous limestone deposited in a reef margin environment that is up to 2,000 feet thick in the region. The upper surface of the formation is characterized by karst-type solution features and brecciation.

Rodeo Creek Formation – Chert Subunit (Drc). The Rodeo Creek Formation (Devonian) has been subdivided into two map units that include a chert subunit (Drc) and silty limestone subunit (Drs). The chert subunit generally consists of black bedded chert that is exposed in the existing Dee Pit south of the project and occurs at depth in the study area. The silty limestone subunit does not occur in the project area. The top of the Rodeo Creek Formation is structurally terminated by the Roberts Mountains thrust fault and marks the top of the lower plate rock sequence.

Upper Plate Rocks

The upper plate rocks consist of the sequence of Paleozoic rocks located above the Roberts Mountains Thrust and represent rocks that have been structurally superimposed onto the chert of the Rodeo Creek unit that is the top of the lower plate. These upper plate rocks crop out or occur at shallow depths across large portions of the Rossi Mine.

Vinini Formation (Ovsc). The Vinini Formation (Ordovician) is the oldest unit in the study area and consists of mostly dark gray to black shale and chert, and cherty mudstone and siltstone. This unit is exposed in two localized areas in the project area.

Elder Sandstone (DSe). The Elder Sandstone (Devonian and Silurian) is an interbedded sequence of mudstone, chert, and dolomitic mudstone that is approximately 300 feet thick. Overall, chert comprises approximately 50 percent of the unit. The unit is resistant to erosion.

Slaven Chert (Dsc). The Slaven Chert (Devonian) is a resistant ridge-forming unit consisting of thin-bedded variable colored chert with approximately 5 percent shale. This unit is the primary host rock for barite mineralization in the proposed pit expansions.

Intrusive Rocks

Two generations of dikes have been recognized locally within the study area that intrude Paleozoic rocks: (1) north-northwest trending lamprophyre dikes (Jbl), dated as Jurassic; and (2) altered diorite dikes (TJd) dated as Eocene (whole rock 40Ar/39Ar age date of 37.6 million years) (Theodore et al. 2006).

Tertiary and Quaternary Units

Rhyolite flow outcrops occur west of Antelope Creek along the western margin of the map area outside of the project study area. Tertiary Carlin Formation sediments cover a large portion of the area underlain by Paleozoic bedrock in the study area. The Carlin Formation (Tcm) includes silt, sand, mudstone and laminated tuff. The thickness of the Carlin Formation is up 1,200 feet in the project vicinity. The Carlin Formation is exposed in the upper highwalls in the existing Queen Pit.

Tertiary and Quaternary unconsolidated older gravel deposits (QTg2) form flat-lying deposits that cover broad areas, including a ridge in the southeastern boundary of the proposed project site. Other Quaternary unconsolidated deposits occur in the area include older alluvium (Qoa) and younger alluvium (Qya) deposits associated with major stream corridors; and younger gravel deposits (QTg1) exposed on the slopes immediately east of Boulder Creek in the southeastern corner of the map area.

Local Structures

Numerous faults have been mapped within the project study area. These include (1) normal faults that typically have a north-south orientation and developed from extension that has affected the region since the Eocene; and, (2) thrust faults that displace the Paleozoic rocks. One of the most prominent normal faults mapped in the study area is the Dee fault that strikes north-south and dips steeply towards the west and traverses through the central portion of the project area (**Figure 3.3-3**). The youngest unit off set by the Dee fault is the Miocene age Carlin Formation sediments.

The Paleozoic rock sequence is disrupted by a number of thrust faults in the project area. Major thrust faults identified in the area, or inferred to exist at depth beneath the site include the Roberts Mountains thrust, Sink thrust, Rossi thrust, and Little Jack thrust faults. The Roberts Mountains thrust is projected to occur at depth beneath the project site as shown on cross sections C-C', and D-D' (**Figure 3.3-4**). Traces of the Sink, Rossi, and Little Jack thrust faults have been mapped at the surface in the project study area.

The Rossi thrust fault is exposed in the Rossi Pit and strikes northeast and dips towards the northwest. Relative displacement of the Paleozoic rocks associated with the thrust faults is illustrated on the cross sections (**Figure 3.3-4**).

A series of folds have been mapped with the Slaven Chert as shown in **Figure 3.3-3**. The folds include both anticlines and synclines, some overturned, with axial trends that are generally parallel to adjacent faults.

Mineralization

The project site contains deposits of barite, an important industrial mineral valued for its high specific gravity and used primarily as a weighting agent in oil and gas drilling. Barite is composed of barium sulfate ($BaSO_4$) and in its pure mineral form it has a calculated specific gravity of 4.5. However, barite can contain impurities, such as silica, that lower the actual specific gravity of the material. The ore grade cutoff for industrial barite produced from the mine is a specific gravity of approximately 4.1 which is the American Petroleum Institute (API) specification for barite used for onshore drilling (API 2010).

At the Rossi Mine, the barite occurs within altered and typically sheared chert beds that are mapped as the Slaven Chert (Theodore et al. 2006). Earlier studies in the region identified the host rock for the barite beds on site as Vinini Formation (Papke 1984). In the Rossi pit area, the barite occurs in one or more localized beds or stratigraphic horizons that range from a few feet to 10's of feet thick that generally strike northeast-southwest and dip to the northwest in the Rossi Pit area. The barite horizons are believed to have formed by the chemical reaction of hydrothermal fluids discharged from hot springs on the ocean floor and sea water (Papke 1984). These types of barite deposits tend to be localized (i.e., do not extend for long distances along strike within the unit) which implies that the barite was formed by chemical precipitation near individual source hot spring vents.

The project study area is situated within the northern portion of the Carlin trend, a 38-mile long, and 1 to 2 mile wide north-northwest alignment of predominantly sedimentary rock-hosted gold deposits (Teal and Jackson 2002). The Carlin trend contains over 40 distinct gold deposits and is recognized as the most productive gold mining district in North America (Jory 2002). The gold deposits within the northern Carlin trend represent a broad range of deposits formed in variable host rocks and structural conditions. The three main styles of gold mineralization identified within the Carlin trend are (1) stratigraphically controlled gold deposits (also known as “Carlin-type” deposits); (2) collapse breccia-hosted gold deposits; and, (3) structurally controlled gold deposits (i.e., mineralization along fault zones, or along folds) (Jory 2002). Gold production in the Carlin trend was initiated in 1965 with the first open pit mine, and underground mining in the district was initiated in 1994. By 2002, more than 50 million ounces of gold had been recovered from 26 separate mines (Teal and Jackson 2002). The nearest known minable gold deposit is the Arturo Project immediately south of the Rossi Mine.

3.3.1.5 Faulting and Seismicity

Faulting

The study area is located in a region that is characterized by active and potentially active faults. For the purpose of this assessment, an active fault is defined as a fault that shows evidence of displacement during the Holocene period (last 10,000 years), and a potentially active fault is a fault that shows evidence of surface displacement during the late Quaternary period (last 150,000 years). Surface fault rupture associated with large earthquakes typically occurs along active fault traces.

Historically, surface displacement along faults occurred in Nevada during major earthquakes (i.e., Richter Magnitude > 6.0) in 1869, 1903, 1915, 1932, and three events in 1954 (Stewart 1980). All of these events occurred along a north-trending zone called the Nevada Seismic Belt located southwest of the study area.

Active and potentially active faults that have been identified in the vicinity of the study area are listed in **Table 3.3-2**. The nearest potentially active fault to the site is a short (1 mile long) fault segment located approximately 2.5 miles west of the site identified by the USGS as the “unnamed fault south of Santa Renia Mountains” (USGS 2016). This fault trends north-northeast and displaces Quaternary-Tertiary alluvium.

Table 3.3-2. Active and Potentially Active Faults in the Region

Fault Name	Length (miles)	Time of Most Recent Deformation	Approximate Distance from the Project Site (miles)
Unnamed fault south of Santa Renia Mountains	1	Quaternary (<1.6 Ma)	2.5
Southeast Sheep Creek Range Fault	29	Late Quaternary (<130 Ka)	5
Eastern Tuscarora Fault Zone	32	Quaternary (<1.6 Ma)	9
Shoshone Range Fault Zone	73	Latest Quaternary (<15 Ka)	15
Tuscarora Fault Zone	14	Quaternary (<15 Ma)	15
Eastern Independence Valley Fault Zone	26	Late Quaternary (<130 Ka)	17

Source: USGS 2016.

Note: Ka = thousand years; Ma = million years.

The northernmost mapped trace of the Southeast Sheep Creek Range fault is located approximately 5 miles southwest of the project area. The Southeast Sheep Creek Range fault is a major range front structure that bounds the southeast margin of the Sheep Creek Range and northwest margin of Boulder Valley. The fault has displaced Quaternary alluvium against Tertiary volcanic rocks.

The Eastern Tuscarora fault zone is located approximately 9 miles east of the project area. This fault zone is defined as a north-northeast trending faults that bound the east margin of the Tuscarora Mountains. Movement along the fault has displaced Quaternary and Quaternary-Tertiary alluvium against Paleozoic bedrock.

The Shoshone Range fault zone is a set of northeast trending fault segments that forms the Western margin of the Shoshone Range and extends approximately 73 miles. The northernmost mapped trace of this fault zone is located in Boulder Flat approximately 15 miles south of the project area in Boulder Flat. The latest surface faulting event for this fault is probably during the Holocene (last 10,000 years) (USGS 2016). This fault system is estimated to be capable of producing a maximum credible earthquake of magnitude 7.2 (BLM 2012a).

Other potentially active fault zones in the region include the Tuscarora fault zone and East Independence Valley fault zone located 11 and 17 miles northeast of the site, respectively. The Tuscarora fault zone trends northeast and displaces early to middle Pleistocene sediments and deposits as young as late Holocene (USGS 2016). The Eastern Independence Valley fault zone is a northeast trending fault zone that displaced early to middle Pleistocene sediments.

Seismicity

The study area is located in a region that has experienced seismic activity in historic time. According to the earthquake database (NCEDC 2016), eleven earthquake events with a Richter Magnitude of 4.5 or greater have been recorded within an approximate 100-mile radius of the project area between 1901 and 2010 (**Table 3.3-3**). The largest recorded earthquake to occur within a 100-mile radius of the project area had a magnitude of 6.8. This earthquake occurred on October 3rd, 1915, approximately 84 miles from the study area. The closest recorded earthquake to the study area with a magnitude of 4.5 or greater was a magnitude 4.6 event that occurred on October 8th, 2001 located approximately 31 miles from the project site (NCEDC 2016).

Table 3.3-3. Recorded Earthquakes with Richter Magnitude of 4.5 or Greater Located within 100-mile Radius of the Proposed Mine Site

Year	Month/Day	Location (latitude, longitude)	Approximate Distance from Site (miles)	Estimated Magnitude
1915	8/03	40.26, -117.65	84	6.8
1984	2/16	39.93, -117.76	100	4.8
2001	10/08	41.22, -115.85	31	4.6
2003	11/23	40.73, -115.15	69	4.5
2008	02/21	41.14, -114.87	80	6.2
2008	02/21	41.10, -114.89	79	4.7
2008	02/21	41.14, -114.84	82	5.1
2008	02/21	41.15, -114.93	77	4.8
2008	02/22	41.13, -114.93	77	4.8
2008	02/27	41.19, -114.83	82	4.8
2008	04/01	41.23, -114.84	82	4.8

Source: NCEDC 2016.

3.3.2 Environmental Consequences

Primary issues related to geology and minerals include: 1) geologic hazards created or exacerbated by development of the proposed project; 2) damage to critical facilities caused by seismically induced ground shaking; and 3) exclusion of future mineral resource availability caused by the placement of waste rock disposal facilities. Potential impacts associated with leaching or acid production from rocks stored in facilities on site or exposed in the pit walls are addressed in Section 3.4, Water Resources and Geochemistry.

3.3.2.1 Proposed Action

Direct impacts on geologic and mineral resources from the proposed project would include: 1) the generation and permanent disposal of approximately 143.5 million tons (MT) of waste rock and 2) the mining and processing of barite ore.

The proposed project would result in an estimated total new disturbance of approximately 1,167 acres. The total proposed project disturbance including existing disturbance, previously authorized disturbance, and proposed disturbance is approximately 2,063 acres. Disturbance associated with open pits that are not backfilled, and construction and expansion of WRDFs would change the topography and geomorphology of the study area. However, disturbance associated with other temporary facilities (e.g., stockpiles, process facilities, ancillary facilities, and haul roads) would eventually be reclaimed to the approximate pre-mining topography and therefore would not permanently alter the natural topography and geomorphic features in the study area.

Open pit mining disturbance for expansion of the King Pit (58 acres); and expansion of the QLC Pit (136 acres) would not be backfilled or reclaimed. Disturbance associated with mining at the proposed Dawn Pit (9 acres) would be completely backfilled and re-contoured to match existing topography. The existing Queen Lode Pit would be backfilled under existing authorizations.

The disposal of waste rock generated during the proposed mining operations would result in 633 acres of new disturbance associated with the expansion of existing and construction of new WRDFs. Although the

WRDFs would be reclaimed including grading to simulate natural slopes in the surrounding area, construction of WRDFs would permanently alter the natural topography of the area.

In summary, the open pit mining expansion (excluding the Dawn Pit that would be backfilled), and expansion of the WRDFs would result in a net increase of approximately 827 acres (i.e., King Pit, [58 acres]; QLC [136 acres] and WRDFs [633 acres]) of area where the natural topographic and geomorphic features would be permanently altered.

Geologic Hazards and Geotechnical Considerations

Geotechnical considerations include potential slope failures of the pit walls, and WRDFs, under static and earthquake loads, and settlement and ground deformation of foundation materials for the WRDFs.

Pit Slopes

The proposed project includes expansion of the existing King Pit, and Queen Pit and Queen Lode Eastern Extension into the renamed QLC Pit and development of a much smaller Dawn Pit (Section 2.3.5, Open Pits). The maximum depth of the pits would be approximately 500 feet at the King Pit, 785 feet at the QLC, and 215 feet at the Dawn Pit; with bottom elevations ranging from 5,325 feet amsl at the King Pit, 5,285 feet amsl at the QLC, and 5,800 feet amsl at the Dawn Pit.

Open pit mines can experience periodic slope instability problems due to weak geologic materials; adversely oriented geologic structures, such as bedding, faults, and jointing; and groundwater presence. Large (Magnitude 5.0 or greater) seismic events can trigger failure of slopes that are marginally stable under static conditions. Impacts associated with potential instability of the pit walls during operation and post-closure are discussed below.

Published geologic mapping of the area indicates that the primary rock units that would be exposed in the pit walls include the Devonian Slaven Chert, and Tertiary Carlin Formation (Theodore et al. 2006). Secondary units projected to be exposed locally in the pits include the undifferentiated mélange unit of the Devonian Slaven Chert, and mafic dikes and fault zones. Although small zones of perched groundwater have been encountered in the King Pit, the proposed pit floor elevations for all of the pits are above the regional groundwater elevations in the area. Therefore, the pits are not expected to encounter significant groundwater (additional information regarding groundwater conditions in the pit areas is summarized in Section 3.4, Water Resources and Geochemistry).

The design of the pit configurations under the Proposed Action has been developed based on HES's experience in similar rock types at the existing mine, available geotechnical data, and surface mining industry and MSHA standards. Geologic structural mapping and open pit wall and groundwater level monitoring would be conducted during mining to optimize pit design and ensure pit stability during operations. Slope movement monitoring would be continued to evaluate the safety of open pit high walls. Final overall pit slope angles would be determined in accordance with the results of pit stability analysis.

A geotechnical evaluation was recently completed to evaluate the stability of the bedrock material to be exposed in the proposed QLC Pit and provide recommendations for design of the pit slopes (Sacrison Engineering 2015). The geotechnical evaluation was based on the results of geotechnical data collection that included drilling and logging seven geotechnical core holes, laboratory testing to provide strength data for use in stability analysis, fracture orientation analysis, and slope stability analysis. Slope design recommendations were developed to satisfy a minimum static factor of safety of approximately 1.0 or greater for all of the pit slopes. A factor of safety is used to provide a design margin to ensure that a slope is stable and would not experience large scale slumping or sliding. (A computed factor of safety greater than 1.0 implies that the slope would be stable and is strong enough to support the assumed design loads.)

The results of the analysis were used to develop specific recommendations for both inter-ramp and overall slope angles, and slope set back distances. The inter-ramp slope angle refers to the slope angle measured from the crest to the toe of slope excluding the ramps; whereas the overall slope angle refers to the angle of the slope measured from the crest to the toe inclusive of any ramps or additional step backs. After completion of the geotechnical study, the preliminary design of the proposed pit slopes for the QLC were modified as necessary to conform to the recommendations provided in the Sacrison

(Sacrison Engineering 2015) report. The final pit design would be developed prior to initiation of mining and modified as necessary as mining progresses and the actual geologic conditions and pit wall performance are verified. The Sacrison (Sacrison Engineering 2015) report provides recommendations for geological engineering mapping as mining progresses, and slope instrumentation and monitoring to allow for modifications to the slope design as necessary as mining progresses to maintain pit stability. Adherence to the slope design recommendation, and ongoing data collection and slope monitoring as specified in the geotechnical analysis is expected to minimize the risk of major slope failures in the QLC Pit.

Waste Rock Disposal Facilities

The proposed project includes the development of several new or expansion of existing WRDFs, as described in Section 2.3.6, Waste Rock Disposal Facilities. The height of the WRDFs would range from 220 to 380 feet above ground surface. The side slopes of the WRDFs would be graded 2.5H:1V to 3.1H:1V for reclamation and would be contoured to simulate natural slopes in the vicinity.

The results of stability analysis for the WRDFs were not available for review. A portion of the material contained within the WRDFs would be from the Carlin Formation. The material derived from the Carlin Formation is generally assumed to have low strength properties compared with the waste rock derived from Paleozoic formations such as the Slaven Chert. During mining and placement in the WRDFs, the Carlin Formation generally would break down into loose weak soil and depending on location could be potentially unstable. (BLM 2012a, Call and Nicholas 2006). In accordance with mitigation measure GM-1, provided in Section 3.3.4, Potential Monitoring and Mitigation Measures, slope stability analysis would be required for the WRDFs to demonstrate that facilities would be stable during operation and closure prior to construction.

3.3.2.2 Reconfiguration Alternative

Under the Reconfiguration Alternative, direct impacts on geologic and mineral resources would consist of 1) the generation and permanent disposal of approximately 143.5 MT of waste rock and 2) the mining and processing of barite. The volume of ore mined, waste rock generated, and ultimate pit configurations associated with expansion of the King Pit, and QLC Pit, and new mining at the Dawn Pit would be the same as the Proposed Action.

The Reconfiguration Alternative would result in an estimated total new disturbance of approximately 1,016 acres. Of the 1,016 acres of total new disturbance, the expansion would include 144 acres of new open pit areas that would not be backfilled; and, 510 acres of WRDFs. New disturbance associated with open pits that are not backfilled, and construction and expansion of WRDFs would change the topography and geomorphology of the study area. Disturbance associated with open pit areas that are completely backfilled may also permanently alter the topography and geomorphology or it may be reclaimed similar to the slope prior to mining depending on original site conditions. Other temporary facilities (e.g., stockpiles, process facilities, ancillary facilities, and haul roads) would be reclaimed to the approximate pre-mining topography and therefore would not permanently alter the natural topography and geomorphic features in the study area.

As with the Proposed Action, the Dawn Pit would be completely backfilled, and the King Pit would not be backfilled. In addition, nearly one half (i.e., 47 percent) of the total area of the QLC Pit would be completely backfilled as part of the Reconfiguration Alternative. This is in contrast to the Proposed Action where the QLC Pit would not be backfilled.

The disposal of waste rock generated during the proposed mining operations would result in 510 acres of new disturbance associated with the expansion of existing and construction of new WRDFs. This represents an approximate 20 percent reduction in the area of new disturbance for WRDFs as compared to the Proposed Action. Although the WRDFs would be reclaimed including grading to simulate natural slopes in the surrounding area, construction of WRDFs would permanently alter the natural topography of the area.

In summary, the open pit mining expansion (excluding pit areas that would be completely backfilled), and expansion of the WRDFs would result in a net increase of approximately 654 acres of new areas where the natural topographic and geomorphic features would be permanently altered (i.e., King Pit, [58 acres]; QLC [86 acres]) and WRDF areas [510 acres]). This represents an approximate 21 percent reduction in the acres

disturbed by unbackfilled open pits and WRDFs as compared to the Proposed Action. Potential impacts associated with the stability of the pits and WRDFs would be the same as described for the Proposed Action.

3.3.2.3 Livestock Fencing Alternative

Under the Livestock Fencing Alternative, a livestock exclusion fence would be installed around the perimeter of the mine facilities as shown in **Figure 2-15**. The fence would be removed once the mine is reclaimed and revegetation is determined successful by the BLM and NDEP. All other aspects of the Proposed Action and Reconfiguration would remain the same if the Livestock Fencing Alternative is implemented with the project approval. Therefore, impacts to Geology and Mineral Resources would be the same as previously described in Section 3.3.2.1, Proposed Action and Section 3.3.2.2, Reconfiguration Alternative.

3.3.2.4 No Action Alternative

Under the No Action Alternative, the proposed project would not be developed, and impacts to geologic and mineral resources associated with the Proposed Action would not occur. The No Action Alternative would consist of continuation of mining and processing operations and closure and reclamation activities at the existing Rossi Mine under the terms of current permits and approvals as authorized by the BLM and the State of Nevada as listed in **Table 2-1**. Direct impacts on geologic and mineral resources for future mining activities under the No Action Alternative would consist of 1) the generation and permanent disposal of approximately 43.5 MT of waste rock, and 2) the mining and processing of approximately 2.4 MT of barite (HES 2015d). Other potential impacts associated with continued operations under the No Action Alternative would be the same as summarized in the EA for the existing operations (BLM 2010a).

3.3.3 Cumulative Impacts

The CESA for geology and minerals is defined in Section 3.3.1, Affected Environment, and is shown in **Figure 3.3-1**. The past, present, and RFFAs are discussed in Section 3.2, Past, Present, and Reasonably Foreseeable Future Actions. RFFAs for mining and exploration activities are identified in **Table 3.2-1**; and, their locations are shown in **Figure 3.2-1 and Figure 3.2-2**. **Figure 3.2-2** also illustrates some ROW actions. There are 27 tracts of land (13,241 acres) leased for oil and gas exploration and 3 tracts leased for geothermal exploration in the CESA. However, there currently is no existing or proposed oil and gas or geothermal development projects located within the study area. In addition, there are several active and inactive sand and gravel material sites located on both BLM and private land near Carlin and south of I-80 within the regional area. Disturbance at individual sand and gravel sites ranges from less than 1 acre up to 40 acres with a total estimated disturbance of approximately 143 acres within the CESA.

3.3.3.1 Proposed Action

Mineral production in the CESA has included gold, silver, barite, and lead; most of the mineral production has come from gold and barite mining operations. In addition, the basin fill material has been mined intermittently as a source of gravel for road construction. Surface mining activity affects geology and mineral resources by excavating, modifying, or covering natural topographic and geomorphic features, and by removing mineral deposits.

Mining disturbance in the CESA has included exploration (drilling, trenching, sampling, and road construction), open pit and underground mining, and construction of waste rock, heap leaching, ore milling and processing, and tailings disposal facilities. For the purpose of this evaluation, geologic disturbance is defined to include mine components such as open pits, waste rock areas, leach pads, and tailings impoundments that permanently alter the natural topographic and geomorphic features in the area, even if reclaimed. In addition to mining, other development in the region includes agricultural development and utilities/community development. Large portions of the CESA also have been affected by wildfires. For the purposes of this evaluation, agricultural, utility, and community development, and wildfires are not considered to result in geologic disturbance, as defined above.

Based on available information, past, present, and RFFAs within the CESA for Geology and Minerals the estimated total ground disturbance related to mining development (excluding exploration) would increase

as a result of Proposed Action from an estimated 36,011 acres to 40,262 acres (2.9 percent). Of this total, approximately 5,670 acres would remain as unreclaimed open pits, 6,509 acres would remain as reclaimed or unreclaimed waste rock, heap leach, and tailings facilities, resulting in a total of 12,179 acres where the natural topography and geomorphology permanently would be altered. Surface disturbance resulting from mineral exploration activity within the Geology and Minerals CESA from past, present, and RFFAs would include an additional 1,175 acres for a total cumulative disturbance of 41,437 acres. Acres of mineral exploration disturbance are temporary in nature and are reclaimed once exploration activities are complete.

The proposed project would result in an estimated 194 acres for expansion of the open pits that would remain after closure and represents an approximate 3.3 percent increase in the cumulative total area that would remain after mining as unreclaimed open pits within the Carlin Trend. The total combined area for the new open pits that would remain after closure, and new or expanded WRDFs is 828 acres. This acreage represents an approximate 6.4 percent increase in the total amount of land where the topography and geomorphology would be permanently altered by mining in the Carlin Trend.

3.3.3.2 Reconfiguration Alternative

Potential cumulative effects to geology and mineral resources associated with the Reconfiguration Alternative would be similar to those described under the Proposed Action with the following exceptions.

Backfilling of the eastern portion of the QLC Pit, and the reduced footprint of the WRDFs under this alternative would result in a small reduction in the cumulative amount of acreage where the topography and geomorphology would be altered by mining. Specifically, the Reconfiguration Alternative would result in an estimated 654 acres for expansion of the unreclaimed open pits (144 acres), and the reclaimed WRDFs (510 acres). These 654 acres represent an approximate 5.1 percent increase in the total amount of land where the topography and geomorphology would be altered by mining in the CESA.

3.3.3.3 Livestock Fencing Alternative

The potential cumulative effects to geology and mineral would be the same as those described under the Proposed Action and Reconfiguration Alternative. This alternative would not affect geologic and mineral resources as it would consist of just installing a fence around the mine site. The fence would create a physical boundary around the active mining area.

3.3.3.4 No Action Alternative

Implementation of the No Action Alternative would not result in any change in cumulative impacts to geology and mineral resources.

3.3.4 Potential Monitoring and Mitigation Measures

Potential impacts to geology and minerals would be minimized by the following recommended mitigation measures. These mitigation measures would apply to both the Proposed Action and the Reconfiguration Alternative.

Issue: Geotechnical designs for the WRDFs were not available for review as part of this EIS. The WRDFs are likely to contain a material derived from the Carlin Formation that may be relatively weak and depending on their locations within the facilities could be unstable.

Mitigation Measure GM-1: Proposed WRDFs would be designed, constructed, monitored, and maintained in a stable manner during both the operation and post-mining periods. Geotechnical investigations and stability analyses would be performed to demonstrate that these facilities would be properly designed and remain stable under both static and seismic loading conditions. The analyses would include an evaluation of the potential for these facilities to contain relatively weak material derived from the Carlin Formation. This evaluation would include estimated volumes of low strength materials in each facility and consider options for isolating or blending as necessary to meet slope stability requirements. The minimum factors of safety for all slope designs would be determined as part of the permits, inspections, and approvals granted by the NDEP and the BLM.

Effectiveness: Proper design, construction, and maintenance of the facilities outlined in this mitigation measure would effectively minimize potential impacts associated with facility stability during the operation and post-mining periods.

3.3.5 Residual Impacts

Residual effects to geologic and mineral resources as a result of the proposed project would consists of the extraction (i.e., removal) of 143.5 MT of barite ore; and creation of an additional 194 acres of open pit that would remain after closure.

3.4 Water Resources and Geochemistry

3.4.1 Affected Environment

3.4.1.1 Hydrologic Setting

The proposed project is located within the Rock Creek Valley (062) and Boulder Flat (061) Hydrographic Areas (HA) that are tributaries to the Humboldt River in north-central Nevada **(Figure 3.4-1)**. The Humboldt River flows westward within a closed basin that terminates at the Humboldt Sink south of Lovelock. The entire Humboldt River basin covers an area of nearly 17,000 square miles.

The principal streams in the Rock Creek Valley HA are Rock Creek and its tributary Antelope Creek. Antelope Creek is located immediately west of the proposed PoO boundary and flows south and then flows southwest and merges with Rock Creek approximately 15 miles downstream from the proposed project. Below the confluence, Rock Creek flows through a rugged canyon cut through the Sheep Creek Range and then enters the western margin of Boulder Flat and converges with the Humboldt River approximately 2 miles east of Battle Mountain.

Boulder Creek is the principal stream in the Boulder Flat HA. Boulder Creek is located to the east and less than one-half mile from the proposed PoO boundary. Boulder Creek generally flows towards the southwest and enters Boulder Valley, a triangular shaped basin that is narrow to the north and wide to the south, about 10 miles south of the project. Flows in Boulder Creek dissipate on the floor of Boulder Valley and does not connect with the Humboldt River (AECOM 2014).

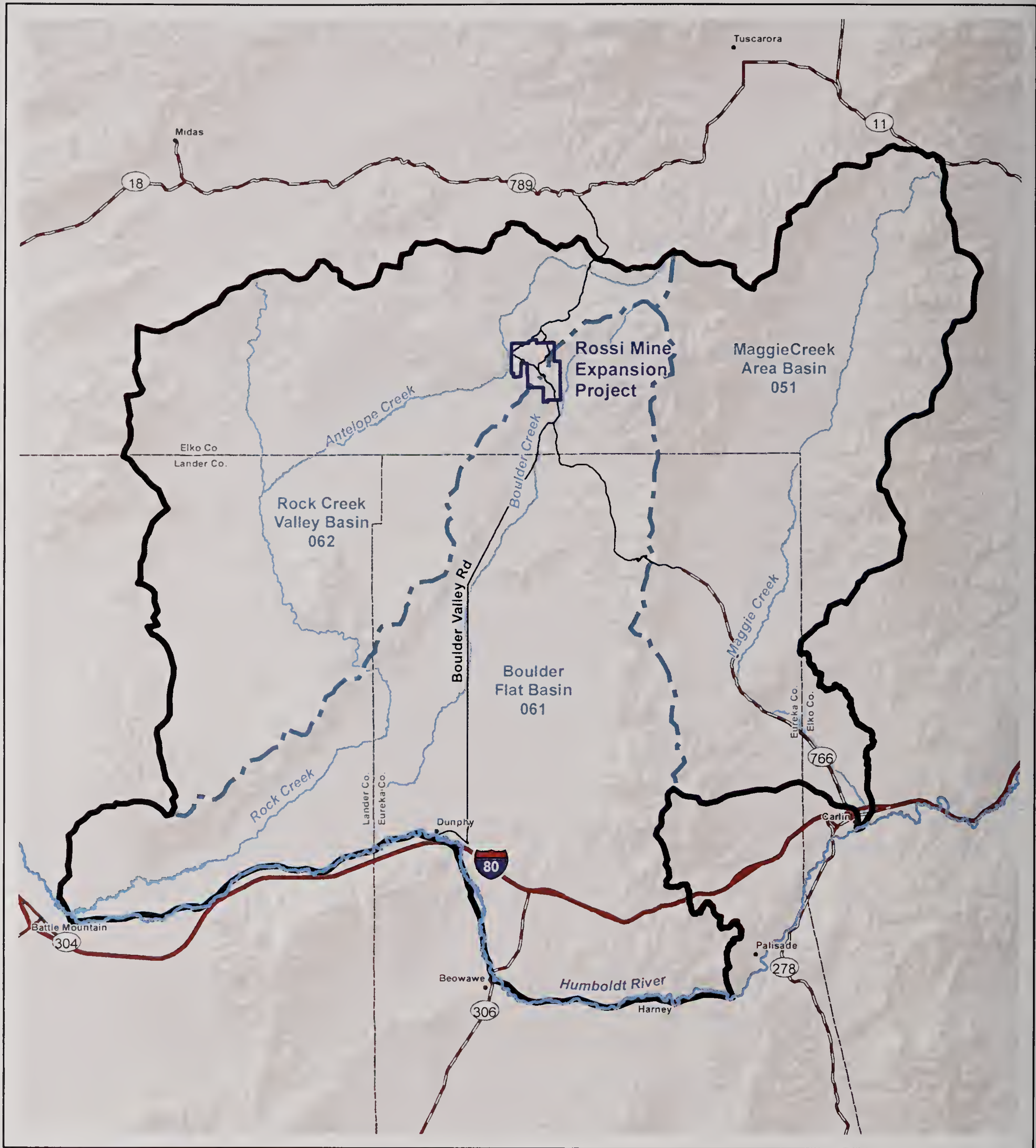
The study area for direct and indirect impacts to water resources consists of the proposed project area and the portions of the Antelope Creek and Boulder Creek watershed areas located adjacent and downstream of the proposed project as shown in **Table 3.4-1**. Elevations in the study area range from approximately 6,150 feet amsl along the watershed divide, to approximately 5,240 feet amsl along Antelope Creek, and 5,280 feet amsl along Boulder Creek (**Figure 3.4-2**).

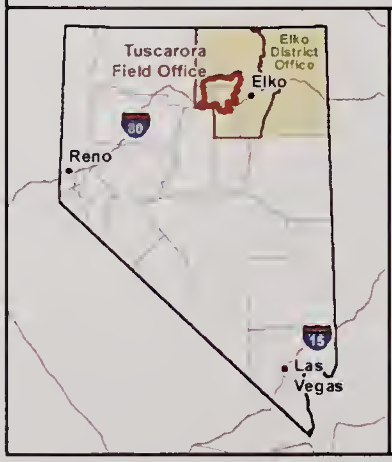
The CESA for water resources encompasses the Rock Creek Valley, Boulder Flat, and Maggie Creek Area HAs as listed in **Table 3.4-1** and shown in **Figure 3.4-1**. All three basins drain southward to the Humboldt River. Both the Rock Creek Valley and Boulder Flat HAs drain areas west of the Tuscarora Mountains, where as the Maggie Creek Area HA drains the eastern side of the Tuscarora Mountains and western flank of the Independence Mountains. The CESA is bounded by unnamed highlands to the north, the Independence Mountains on the east, and the Humboldt River on the south. Elevations within this CESA range from 8,800 feet amsl in the Tuscarora Mountains to 4,500 feet amsl along the Humboldt River.

Table 3.4-1. Hydrographic Basins within the CESA for Water Resources

Nevada Designated Hydrographic Basins	Basin Number	Approximate Land Area (square miles)
Rock Creek Valley	62	450
Boulder Flat	61	560
Maggie Creek Area	51	410

Source: NDWR 2015.





Proposed Project Boundary

Water Resources Cumulative Effects Study Area

Hydrographic Basin

Source: NDWR 2015, SRK 2014a.

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Figure 3.4-1

Water Resources Cumulative Effects Study Area

0 1 2 3 4 5 10 Miles

0 1 2 3 4 5 10 Kilometers

1:500,000

N

10/12/2017

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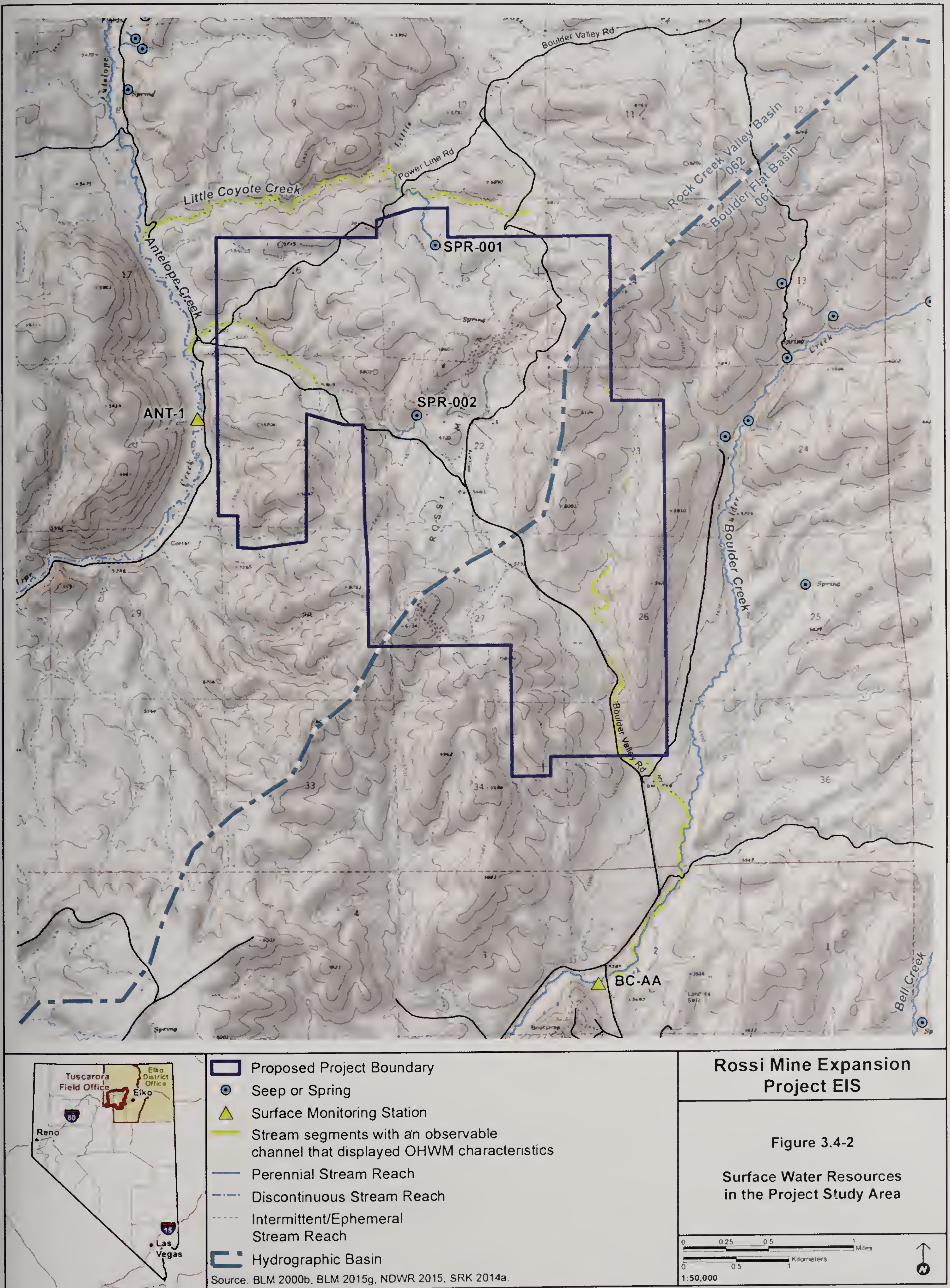

Figure 3.4-2

Surface Water Resources in the Project Study Area

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Original data were compiled from various sources. This information may not meet National Map Accuracy Standards
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Climate

Regionally, the average annual precipitation varies, but it generally increases with elevation. Most of the precipitation falls during winter and spring. Across the CESA, the estimated average annual precipitation (1981-2010) ranges from approximately 8 inches in lower elevation areas in Boulder Flat to approximately 25 inches at higher elevations in the Tuscarora and Independence Mountains (PRISM 2016). Local climate is important to define because rainfall, snowfall and evaporation rates control the surface water flow and groundwater recharge. A weather station was recently established on site to collect temperature, precipitation, barometric pressure, wind and evaporation data, and data are available for 2014 (SRK 2015a). However, historical meteorological data is not available to define the long-term average annual precipitation and evaporation rates for the proposed project. The recently completed EIS for the Arturo Mine Project located immediately south of Rossi Project site assumed an estimated average annual precipitation of 10.7 inches (BLM 2014a) based on the average precipitation at the Goldstrike Mine located approximately 4.4 miles south of the Arturo Project and located in a similar topographic setting. The nearest meteorological station with long-term precipitation data is located approximately 18 miles northeast of the project at Tuscarora, Nevada (268346) at an elevation of 6,170 feet amsl. Based on a period of record from 1981 to 2010, the average annual precipitation at that location is approximately 12.31 inches a year (WRCC 2016).

The average precipitation for the proposed project area was estimated using PRISM (Parameter-elevation Relationships on Independent Slopes Model): an interpolation method that uses meteorological station data and major physiographic factors influencing climate patterns to predict the spatial distribution of precipitation across the conterminous United States. Using the 30-year historical record (1981-2010), the PRISM model estimates that the average annual precipitation for the project area is 11.9 inches per year. The average monthly precipitation estimates based on the same 30-year period indicates that July, August, and September are typically the driest months; and, November, December, January, March, April and May are the wettest months (**Table 3.4-2**). The average annual lake evaporation rate for this region is approximately 44.6 inches (BLM 2014a).

Table 3.4-2. Average Precipitation Estimates for the Project Area (1981-2010)[1]

Month	Precipitation (inches)
January	1.27
February	0.99
March	1.22
April	1.17
May	1.36
June	0.86
July	0.31
August	0.36
September	0.67
October	0.94
November	1.28
December	1.47
Annual Average	**11.9**

Source: PRISM 2016.

[1] Estimates based on the PRISM model output for the 1981-2010 period and site location.

3.4.1.2 Surface Water Resources

This section describes surface water resources including stream, seeps and springs, and ponds in the region and in the project vicinity. Major streams and known springs and seeps within the region are shown in **Figure 3.4-3**; and within the project vicinity are illustrated on **Figure 3.4-2**.

Watershed Areas and Streams

The proposed project area is located within two watershed areas. The northern and western portions of the site are within the Antelope Creek watershed (Rock Creek Valley HA); and the southeastern portion of the site is within the Boulder Creek watershed (Boulder Flat HA) (**Figure 3.4-2**). Antelope Creek is located adjacent to, and flows parallel to, the western boundary of the proposed PoO. Antelope Creek is a tributary to Rock Creek that flows into the Humboldt River near Battle Mountain, Nevada. Boulder Creek is located within ½ mile of the eastern boundary of the proposed PoO and flows southwest into Boulder Valley where the flow dissipates on the valley floor and does not reach the Humboldt River (AECOM 2014, BLM 2012a).

Flows in Antelope Creek and Boulder Creek are monitored monthly as part of the BGMI Boulder Valley Monitoring Plan (BVMP) approved by the State Engineer as a condition of their water rights in 1991 (BGMI 2015). The results of the BVMP are provided in biannual reports submitted to the State Engineer and BLM. Monitoring required in the BVMP includes two sites located in the project vicinity: ANT-1 (Antelope Creek) and BC-AA (Boulder Creek) shown on **Figure 3.4-2**.

Antelope Creek has been monitored at station ANT-1 located immediately west of the proposed PoO boundary (**Figure 3.4-2**) since June of 1995. Data in the BVMP through the third quarter 2015 at Station ANT-1 indicate a consistent pattern of measurable flow in spring to early summer with no measurable flow from mid-summer through fall period. The maximum recorded flow at ANT-1 was approximately 20,000 gpm [44 cubic feet per second (cfs)] in the spring of 1988. Flow at the two other stations (ANT-2, ANT-3 are illustrated on **Figure 3.4-3**) included in the BVMP that are located several miles downstream from the project area indicate that in the past 15 years, these stations are dry most of the year (and sometimes for several years) except for flow recorded in some years in the early spring. For example, no flow has been recorded at station ANT-3, located just above the confluence with Rock Creek, since the spring of 2009. Maurer et al. (1996) characterized the entire length of Antelope Creek as predominantly an ephemeral stream, except for short reaches sustained by small groundwater baseflows.

The flow at station BC-AA in Boulder Creek, located approximately 1.3 miles south (downstream) from the proposed PoO boundary (**Figure 3.4-2**) has been monitored since March 1993. The monitoring indicates that the stream flow is intermittent and is typically dry from late June or July until March. The maximum recorded recent flow at BC-AA was approximately 37,000 gpm (82.4 cfs) in April 2006 (BGMI 2015). Downstream, flow data from two additional stations BC-B, and BC-C (illustrated on **Figure 3.4-3**) indicate that evapotranspiration and seepage losses into the stream alluvium reduce the flow duration in Boulder Creek to ephemeral conditions (BLM 2008a, BLM 2000b, BLM 1991a). Downgradient in Boulder Valley (also known as "Boulder Flat"), these temporary channel flows are routed into a series of agricultural diversions and the channel features become indistinguishable from the surrounding terrain (AECOM 2014, BLM 2012a). Over its entire length, Boulder Creek is characterized as an ephemeral stream except for a short reach near upper headwater areas where flow is sustained by spring discharge (Maurer et al. 1996). Downstream, flow appears to dissipate in Boulder Valley and does not reach the Humboldt River (AECOM 2014, BLM 2012a).

Proposed Project Boundary	
Water Resources Cumulative Effects Study Area	
Hydrographic Basin	
Seep or Spring	
Surface Water Monitoring Station	
Perennial Stream Reach	
Discontinuous Stream Reach	
Intermittent/Ephemeral Stream Reach	

Source: BLM 2000b, BLM 2015g, NDWR 2015, SRK 2014a.

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Figure 3.4-3

Streams, Springs and Seeps within the Cumulative Effects Study Area

0 1 2 3 4 5 10 Miles
0 1 2 3 4 5 10 Kilometers
1:500,000

10/12/2017

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Within the proposed project area, except for short reaches supported by spring flow from springs SP-001, and SP-002 (**Figure 3.4-4**) discussed below, the streams are characterized as relatively steep, ephemeral channels that drain towards Antelope Creek. AECOM (2014) conducted field surveys of all stream reaches in the proposed project area and identified stream segments totaling 8.64 miles that had an observable channel that displayed Ordinary High Water Mark (OHWM) characteristics (**Figure 3.4-2**). The channel beds were up to 2.5 feet wide and had shallow depths indicating low flow rates. AECOM identified two stream reaches that have continuous OHWM indicators that connect with Antelope Creek. One stream reach was Little Coyote Creek located immediately north of the proposed PoO boundary. The other stream reach was an unnamed northwest flowing ephemeral drainage located parallel to, and in close proximity (< 1,000 feet) to, the Antelope-Boulder Connector Road located in the western portion of the proposed project site. An ephemeral tributary channel to Boulder Creek drains the southeast section of the proposed project area (AECOM 2015a).

Further details regarding flows in Boulder Valley and other streams in the CESA (**Figure 3.4-3**) are provided in previous NEPA documents associated with major gold mine projects as submitted by BLM in these HAs (BLM 2008a, BLM 2000b).

Springs and Seeps

A large number of springs have been inventoried within the CESA (**Figure 3.4-3**). Two field investigations were undertaken to inventory perennial seeps and springs located around the Goldstrike Mine (BLM 2000b). Both inventories were conducted in the fall to identify seeps and springs discharging groundwater at the low-flow time of the year. The first inventory was conducted in 1989 and covered an area within a 10-mile radius of the Goldstrike Mine. This inventory included the Boulder, Bell, Brush, and Rodeo Creek watersheds and identified 131 seeps and springs. The second inventory was conducted in 1993 (BLM 2000c) and covered approximately 600 square miles. This inventory included the Willow Creek, Rock Creek, and Antelope Creek watersheds and springs located in the northern, southern, and eastern portions of the Tuscarora Mountains. A total of 277 springs were identified with perceivable flows and 211 seeps with no measurable flow. Additional spring inventories in the region around the Gold Quarry Mine identified approximately 200 seeps and springs (BLM 1993b, BLM 2000b).

Flows in springs identified in the region around the Goldstrike Mine, except for Green, Knob, and Sand Dune springs in Boulder Valley that are associated with the discharge of dewatered mine water, ranged from less than 1 gpm to 140 gpm, with most having a discharge less than 3 gpm (BLM 2000b). Only four springs had flows greater than 10 gpm with 90 percent of the springs showing flows between 1 and 3 gpm during the fall months. Springs inventoried in the northern part of the Tuscarora Mountains, Boulder Flat, Rock Creek, and Willow Creek basins had temperatures ranging from 38 to 78°F. No springs with temperatures greater than 90°F were identified. In the Maggie Creek, Mary's Creek, and Susie Creek basins, five hot springs were identified (BLM 2000b).

SRK (2013c) conducted a surface water survey in 2012 to inventory seeps, springs, ponds and other water features in the proposed project area (SRK 2013c). The survey used color infrared aerial photography and USGS topographic maps and field surveys to identify and sample surface water features within the hydrologic study area. The inventory identified two spring sites (SP-001, SP-002), and 23 other water features described as seasonal ponds or seasonal stock ponds (**Figure 3.4-4**). A related study conducted by EcoSynthesis (2013) performed field investigations of all of the spring and water feature sites identified by SRK to identify and map areas with riparian vegetation (EcoSynthesis 2013). The results of that study concluded that only two springs (SP-001, SP-002) sites were observed and perennial flow from these springs supports riparian vegetation along the drainage corridor downstream from the spring source. EcoSynthesis also concluded that all of the other water features observed on site represent seasonal ponds where runoff is captured periodically behind or adjacent to anthropogenic features such as berms or dirt roads. Details regarding riparian and wetland surveys, and jurisdictional wetlands determinations are provided in Section 3.14, Vegetation, including Riparian Zones and Wetland Areas.

The locations of the two springs (SP-001 and SP-002) identified within the proposed PoO boundary are shown in **Figure 3.4-4**. These two springs were previously identified in the Rossi Mine EA (BLM 2010a) as the "north spring" (SP-001) and "south spring" (SP-002).

Spring SP-001 emerges at the toe of the north slope of the King North WRDF. The spring area covers approximately 1.38 acres and supports flow and riparian vegetation (SRK 2013c, EcoSynthesis 2013) in the unnamed drainage that flows north as shown in **Figure 3.4-4**. This drainage flows into Little Coyote Creek located approximately 0.5 mile north of the spring and outside of the PoO. Flow was monitored on a quarterly basis in both springs between the second quarter of 2012 and the second quarter of 2015. Between May 2012 and June 2015, the measured flow rate at SP-001 ranged from 5 to 266 gpm. Flow was not measured in December 2012, 2013, and 2014 because the spring was ice covered. The USGS topographic quadrangle map for the site indicates that a spring was located in the general vicinity of the King North WRDF prior to construction of the facility. Several options for origin of the spring flow were discussed in the 2010 EA for the Rossi Mine:

> *"Flow from the "north spring" is probably the result of the release of water storage over time from the North Dump. A contributing water source could also be from remnant subsurface spring features under the North Dump, or it could be seepage water from storm water which collects between the North Dump and the natural hillside directly to the east." (BLM 2010a).*

Spring SP-002 originates from the toe of slope along the southern margin of the King South WRDF. The spring area covers an estimated area of 0.69 acres and supports riparian vegetation (SRK 2013c, EcoSynthesis 2013) in an unnamed drainage that flows towards the southwest (**Figure 3.4-4**). Further downstream, (approximately 0.25 mile downstream from the spring) the unnamed drainage crosses the Antelope-Boulder Connector Road then turns west. AECOM (2014) noted that water ponds in the low spot in the dirt roadway at the drainage crossing; and that surface water flows dissipate downstream from the road crossing (AECOM 2014). The measured flow rate at SP-002 between May 2012 and June 2015 ranged from 2 to 8 gpm. Flow was not measured in December 2013 because the spring was frozen. Review of aerial photographs taken in 1970, and 1987, indicate that there were no springs in the vicinity of the King South Dump prior to its construction (BLM 2010a). The BLM (2010a) postulated that most of the flow in spring SP-002 results from seepage from unlined ponds located to the east of the spring (BLM 2010a). The BLM also acknowledged that some of the flow may result from the meteoric water that infiltrates through the WRDF (BLM 2010a).

Ponds

Three unlined ponds constructed for ore processing are located south of the jig plant: the upper pond, lower pond, and stock pond as shown on **Figure 3.4-4**. These ponds have been in use in their current configuration since 1977 (AECOM 2015b). The upper and lower ponds collect fines from the jig plant and recirculate jig water. The stock pond provides water storage and is used for overflow and makeup water. The mine does not have any solution ponds, and no reagents are used in the jigging process. Several small seasonal cattle pond type features were created by constructing berms across ephemeral drainages. The location and description of these seasonal water features are provided in the seep and spring inventory report (SRK 2013c).

Flood Hydrology

No regulatory floodplain (Flood Hazard Zone A) delineations have been made by the Federal Emergency Management Agency (FEMA) in the study area or nearby along Boulder Creek or Antelope Creek (FEMA 2016). From a geomorphic perspective, narrow floodplain deposits or low-lying areas that would be inundated from a large precipitation or snowmelt event occur along all of the ephemeral stream channels in the proposed project area. Inundated channel areas probably would be on the order of up to approximately 5 feet wide based on the width of the mapped OHWM observed on site (AECOM 2014) but would depend on the size of a particular runoff event. The 100-year, 24-hour point precipitation for the study area is 2.73 inches (SRK 2014c).

- Project Study Area
- Seep or Spring
- Seasonal Stock Pond or Seasonal Pond
- Perennial Stream Reach
- Discontinuous Stream Reach
- Intermittent/Ephemeral Stream Reach
- Riparian Zone

Source: SRK 2013c, SRK 2014a, EcoSynthesis 2013, BLM 2000b

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Figure 3.4-4

Surface Water Resources in the Project Area

0 0.1 0.2 0.3 0.4 0.5 Miles
0 0.25 0.5 0.75 1 Kilometers
1:30,000

N

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Waters of the United States

Field surveys to identify and evaluate the potential jurisdictional status of ephemeral channels and wetlands within the proposed project area were performed by AECOM in 2012 and 2014. The field surveys mapped and characterized all isolated water body features that are solely contained in the proposed project area, as well as features that have a potential tributary connection to the principal streams, Antelope or Boulder Creek, located in the project vicinity (AECOM 2014). The results of the field surveys identified 16 stream segments totaling 8.64 miles that had an observable channel that displayed OHWM characteristics; and, 8 wetland areas totaling 9.95 acres (Figure 3, AECOM 2014). The U.S. Army Corps of Engineers (USACE) reviewed the results of the investigation and concluded that these mapped streams and wetlands located within the project study area are isolated waters with no significant nexus to a navigable water and no apparent interstate or foreign commerce connection. As such, these waters are not subject to federal jurisdiction, and not regulated, under Section 404 of the Clean Water Act (USACE 2015).

3.4.1.3 Groundwater Resources

Recharge, storage, and movement of groundwater is dependent in part on the geologic conditions and topography of a site. The general stratigraphic and structural framework throughout the hydrologic study area and the proposed project area are described in Section 3.3, Geology and Minerals. For the purpose of characterizing the groundwater conditions in the region, the geologic formations have been grouped into six hydrostratigraphic units. The general physical characteristics of these units are presented in **Table 3.4-3.**

Table 3.4-3. Summary of Hydrostratigraphic Unit Properties

Hydrostratigraphic Unit	Reported Yields (gpm)	Estimated Hydraulic Conductivity (feet per day)	Estimated Transmissivity (square feet per day)	Estimated Specific Yield (no units)
Marine Carbonate Rocks	500 - 5,000[2]	0.1 - 100[2]	13 - 300,000[2]	0.0002 - 0.03[2]
Marine Clastic Rocks	10 - 600[2,3]	0.01 - 0.5[2]	30 - 800[2]	0.0001 - 0.004[2]
Intrusive Rocks	Generally <100[2]	0.01 - 1[2]	NA	NA
Volcanic Rocks	Up to 5,800 in Boulder Valley[2]	0.5 - 200[2]	300 - 100,000[2]	0.0007 - 0.07[2]
Older Basin-fill	<100 - 1,000[1]	0.05 - 5[2]	20 - 14,000[2]	0.01 - 0.10[2]
Younger Basin-fill	Up to 3,600 in Boulder Valley[2]	1 - 100[2]	4,500[1] - 13,400[2]	0.15 - 0.252[2]

[1] Source: Maurer et al. 1996.
[2] Source: MMA 1996a, MMA 1996b, MMA 1998.
[3] Where highly fractured, may yield more than 600 gpm.

NA No data available.

These six hydrostratigraphic units include two distinct types of materials: fractured rock (carbonate, siliceous, intrusive, volcanic, and bedrock), and unconsolidated to poorly consolidated sediments (alluvial and basin-fill deposits). In the bedrock units, recharge, storage, flow, and discharge of groundwater primarily are controlled by the secondary features (i.e., fractures, faults, and solution cavities) that enhance the porosity and permeability of the rock. In the unconsolidated to poorly consolidated sediment, the groundwater is stored and transmitted through interconnected pores within the sediments.

Hydrogeologic Units

The six hydrostratigraphic units and their hydrogeologic characteristics are discussed below.

Marine Carbonate Rocks

The Paleozoic marine carbonate rocks consist of limestone and dolomite and lesser amounts of shale, sandstone, and quartzite that are part of the lower plate of the Roberts Mountain Thrust (see Section 3.3, Geology and Minerals, for additional details). These rocks are mainly Cambrian to Devonian in age but locally also include Pennsylvanian/Permian carbonate rocks. These rocks are part of the Carbonate Rock Aquifer Province, a major bedrock carbonate aquifer system that covers extensive areas in eastern Nevada (Prudic et al. 1995). Regional maps infer that the northwestern boundary of the Carbonate Rock Aquifer Province is located near the proposed project area (Prudic et al. 1995). Carbonate rocks appear at the surface in the Tuscarora Mountains south of the Betze-Post Pit and in bedrock outcrops in the Maggie Creek and Susie Creek basins. Carbonate rocks are believed to underlie the younger units and the marine clastic rocks (beneath the Roberts Mountain Thrust) in areas within the carbonate rock province. In areas of carbonate rock outcrop, the overlying clastic rocks and younger volcanics are thought to have been removed by erosion (MMA 1996a).

The marine carbonate rocks have low primary permeability. However, where they are faulted or fractured coupled with dissolution, their transmissive properties greatly increase. Secondary permeability can raise the hydraulic conductivity of the marine carbonate rocks approximately 100 feet per day and result in a transmissivity as high as 300,000 square feet per day. The specific yield for these rocks ranges from 0.0002 to 0.03. Yields from wells in this formation are relatively low and range from 500 to as much as 5,000 gpm due to secondary permeability.

Marine Clastic Rocks

The Paleozoic marine clastic rocks consist of interbedded shale, siltstone, chert, quartzite, and limestone. Marine clastic rocks are believed to underlie the alluvium and volcanic rocks in most of the study area, and they form the upper plate of the Roberts Mountain Thrust. These clastic rocks are exposed in the Tuscarora Mountains, Independence Range, and Adobe Range (**Figure 3.3-2**). They have been extensively thrusted and eroded, and estimates of their thickness range from 50 to 5,000 feet. These rocks are fine-grained and have low hydraulic conductivity with most reported values ranging from 0.01 to 0.5 feet per day (MMA 1996a), but local faulting, fracturing, and solution widening can increase secondary permeability (Maurer et al. 1996). Transmissivity ranges from 30 to 800 square feet per day, and the specific yield ranges from 0.0001 to 0.004. Well yields are low and in the range of 10 to 600 gpm.

Intrusive Rocks

Tertiary through Jurassic intrusive rocks are a minor component of the rock types in the study area and consist mostly of granodiorite, quartz monzonite, monzonite, and diorite. The intrusive rocks tend to form relatively impermeable boundaries or impediments to groundwater flow. Reasonable estimates of hydraulic conductivity are 0.01 to 1 feet per day, and wells generally yield less than 10 gpm (MMA 1996a). Wells completed in the intrusive rocks may yield small quantities of water near some faults (Maurer et al. 1996).

Volcanic Rocks

The volcanic rocks consist of Tertiary through Jurassic aged rocks that include a wide range of igneous rock types: rhyolitic to basaltic lava flows, welded and non-welded ash-fall tuffs, flow breccia, and tuffaceous sedimentary rocks. The volcanics occur throughout the area with most of the exposures in the western, northern, and south-central portions of the CESA. This wide range of rock types results in highly variable hydraulic parameters. The welded tuff, basalt, and andesite generally have low transmissive properties, while the rhyolite, particularly where fractured, is more transmissive. Estimates of hydraulic conductivity range from 0.01 to 200 feet per day, with transmissivity ranging from 300 to as much as 100,000 square feet per day. The specific yield has been estimated to range from 0.0007 to 0.07 in the case of the Boulder Valley rhyolite. Yields from wells in this formation can be up to 5,800 gpm.

Older Basin-fill Deposits

The older basin-fill deposits (including the Carlin Formation) are Pliocene to Miocene age and are primarily composed of poorly consolidated shale, claystone, mudstone, siltstone, sandstone, conglomerate, freshwater limestone, tuff and lava flow (Maurer et al. 1996; Plume 1995). These deposits accumulated in basins that developed in the earliest stages of extensional faulting. In the upper Maggie Creek basin, these deposits are estimated to be up to 6,000 feet thick. In Susie Creek and lower Maggie Creek basins, the deposits are generally less than 2,000 feet thick (Hydrologic Consultants 1999). Wells completed in the Carlin Formation have reported relatively small yields ranging from less than 100 to 1,000 gpm. In the Maggie Creek area, hydraulic conductivity ranges from 1 to 7 feet per day and transmissivity from 780 to 9,800 square feet per day (Maurer et al. 1996). In the northern part of Boulder Flat, transmissivity is estimated to range from 70 to 300 square feet per day. Locally, the fine-grained beds act as an aquitard producing confined groundwater conditions in the underlying rocks (BLM 1991a). The estimated specific yield is in the range of 0.01 to 0.10.

Younger Basin-fill Deposits

The Quaternary alluvium contains a wide range of materials: sandy clay, silty sand, gravelly sand, and sandy gravel. The thickness and lateral extent of this material also is highly variable. In higher elevation mountain areas, the alluvium occurs as discontinuous to continuous strands of unconsolidated material covering or partially covering bedrock along the floor of the valley or ravine. Alluvium in higher elevation areas generally is less than a few tens of feet thick. In broad basin areas, such as Boulder Flat, and to a lesser extent in the Maggie Creek and Susie Creek basins, the alluvium occurs as sequences of unconsolidated to poorly consolidated material up to 1,000 feet thick (MMA 1996a). Overall, the alluvium is generally coarser-grained in the mountains and finer-grained in the basins, and it becomes finer toward the center of the basin. The alluvium also is characterized by significant lateral and vertical stratigraphic variation with clay typically occurring as thinly bedded lenses. The alluvium generally is presumed to be an unconfined aquifer; however, semi-confined conditions may exist locally where less permeable fine-grained units inhibit vertical flow. Well yields can range up to 3,600 gpm in Boulder Valley, with hydraulic conductivities ranging from 1 to 100 feet per day, transmissivity ranging from 4,500 to 13,400 square feet per day, and a specific yield estimated to range from 0.15 to 0.25.

Hydrostructural Units

Faults can serve as pathways for groundwater flow or act as barriers to flow, depending on the nature of the brecciation along the fault and the permeability of units juxtaposed by the faulting. Fractures, bedding planes, and cavities in bedrock units often allow for local flow of groundwater and create increased permeability over a defined area. Long-term monitoring of water level changes in the vicinity of the Barrick Goldstrike Mine has resulted in the recognition of three major fault zones that impede groundwater flow across the fault zone: Boulder Narrows Fault, Siphon Fault, and Post Fault. Other faults with the potential to influence groundwater flow and groundwater dewatering are the Little Boulder Basin Fault, the Tuscarora Fault on the east side of the Tuscarora Mountains, and the Gold Quarry Fault (BLM 2008a, BGMI 2015). The influence of these structures on the groundwater flow system generally is characterized by a noticeable change in gradient and water levels on either side of the faults. These hydrostructural features are described in the Betze Project, Draft Supplemental EIS (BLM 2000c) and Betze Pit Expansion Project, Draft Supplemental EIS (BLM 2008a).

Production and Monitoring Wells

The location of the project groundwater production wells (PW) and MW, and other groundwater monitoring wells included in the BVMP that occur in the project vicinity are shown on **Figure 3.4-5**. As of June 2015, there were 4 fully permitted water supply wells (PW-1, 3, 4 and 5) on site associated with currently authorized mining activities. The completion depths, screen intervals, lithologic description of the screen intervals, depth to water, and recent reported pumping rates for the project wells are summarized in **Table 3.4-4.** All of the wells are completed in bedrock and their depths range from 115 to 2000 feet. PW-3 and PW-5 are apparently completed in the Tertiary sequence (AECOM 2015b); and PW-1 and PW-3 are screened in the Slaven Chert.

The maximum average monthly pumping rate for the 4 production wells over the first 6 months of 2015 ranged from 0 to 21.3 gpm. Three of the wells (PW-1, 2, and 5) are currently in use and reportedly provide up to approximately 50 gpm of groundwater for use in the mining and ore processing operations (AECOM 2015a). The fourth production well (PW-4) is currently used for monitoring (AECOM 2015a).

The four required groundwater monitoring wells (MW-1, 2, 3, and 4) were installed in 2013 (Golder 2014). MW-1 was located upgradient, and MW-2 was located downgradient from the Stock Pond. MW-4 was located upgradient, and MW-3 was located downgradient of the Jig Plant and associated processing facilities and upper and lower pond areas. The depths of the monitoring wells range from 115 to 1,400 feet; and the depth to groundwater ranges from 55 to 859 feet below ground surface. All of these monitoring wells were constructed in rock described as chert that is presumed to be part of the Slaven Chert Formation that occurs over large areas of the site as described in Section 3.3, Geology and Minerals. Groundwater quality sampling and monitoring results for the monitoring wells are summarized in Section 3.4.1.4, Water Quality.

MW-2R, MW-3R, and MW-5 (locations shown on **Figure 3.4-5**) were installed in June 2015. MW-2 and MW-3 were abandoned in June and July, 2015 because the wells were suspected to be impacted by intrusion of cement grout into the well and/or surrounding gravel pack during construction (AECOM 2015c). The NDEP recommended replacement of MW-2 and MW-3 with shallower groundwater monitoring wells (NDEP 2015b). The maximum planned depth for these three new monitoring wells was 300 feet (NDEP 2015c).

MW-2R was completed in material logged as siltstone, mudstone, and the last 10 feet of the well are in chert (AECOM 2015d). Water levels recorded for MW-2R from June 2015 to March 2016 ranged from 68.4- to 63.3-feet below ground surface (bgs).

MW-3R and MW-5 were completed in chert at depths of 300 feet bgs and did not encounter groundwater and have remained dry since construction (AECOM 2015b, AECOM 2017b).

Table 3.4-4. Halliburton Production and Monitoring Wells

Basin	Map ID	Permit No.	Type	Well Depth[1] (feet-bgs)	Screen Interval[1]	Lithology Description[1] (Screen Intervals)	Depth to Water[2] (feet-bgs)	Maximum Reported Monthly Pumping Rate[4] (gpm)	Operational Status	Current Sampling Frequency[11]	Location
62	PW-1	42932	Production	2000	900 - 1,000 1,290 - 1,990	CHERT – black and gray	NA	21.3	Active	Annually	Northeast (upgradient) of the Lower Pond
62	PW-3	61410	Production	520	330 - 350 500 - 520	SANDSTONE – brown with gray layers	237.41[2]	17.8	Active	Annually	North (upgradient) of the Proposed QLC
62	PW-4[10]	70710	Production	780	700 - 780	CHERT – black	429.10[2]	0	Active	Annually	Northeast (upgradient) of the Crushing and Jigging Facilities
62	PW-5	76543	Production	891	132 - 152 194 - 214 298 - 318 424 - 444 569 - 589 609 - 629 649 - 669 711 - 731 751 - 771 851 - 891	ASH with CHERT – brown SANDSTONE with CHERT – gray SHALE – black, gray	457.10[2]	6.7	Active	Annually	East (upgradient) of the Stock Pond
62	PW-6[7]	73322	Production	400	60 - 400	CHERT – black, red, with fracture zones	62[8]	[9]	Abandoned	-	King Pit
62	MW-1	-	Monitoring	1400	780 - 820 1,120 - 1,140 1,160 - 1,180 1,260 - 1,300 1,360 - 1,380	CHERT – black, with fracture zones	859.04[2]	-	Active	Quarterly	South of the Stock Pond
62	MW-2[5]	-	Monitoring	1000	880 - 980	CHERT – black, with fracture zones	852.52[3]	-	Abandoned	-	Northwest of the Stock Pond

Table 3.4-4. Halliburton Production and Monitoring Wells

Basin	Map ID	Permit No.	Type	Well Depth[1] (feet-bgs)	Screen Interval[1]	Lithology Description[1] (Screen Intervals)	Depth to Water[2] (feet-bgs)	Maximum Reported Monthly Pumping Rate[4] (gpm)	Operational Status	Current Sampling Frequency[11]	Location
62	MW-2R[6]	-	Monitoring	115	60 - 110	SILTSTONE/ MUDSTONE/ CHERT	68.4[2] 55.59[12]	-	Active	Quarterly	West of Stock Pond
62	MW-3[5]	-	Monitoring	960	840 - 940	CHERT – black and gray, with fracture zones	612.01[3]	-	Abandoned	-	Southwest (down gradient) of the Lower Pond
62	MW-3R[6]	-	Monitoring	300	245 - 295	CHERT – gray	Dry[3,12]	-	Active	Quarterly	Southwest (down gradient) of the Lower Pond
62	MW-4	-	Monitoring	590	450 - 570	CHERT – black, with fracture zones	388.65[2] 384.63[12]	-	Active	Quarterly	Northeast (upgradient) of the Crushing and Jigging Facilities
62	MW-5		Monitoring	300	245 - 295	CHERT – reddish brown to dk. gray	Dry[3,12]	-	Active	Quarterly	Southwest (downgradient) of the King North WRDF

Sources: AECOM 2015d; Golder 2014; HES 2015c; AECOM 2017b.

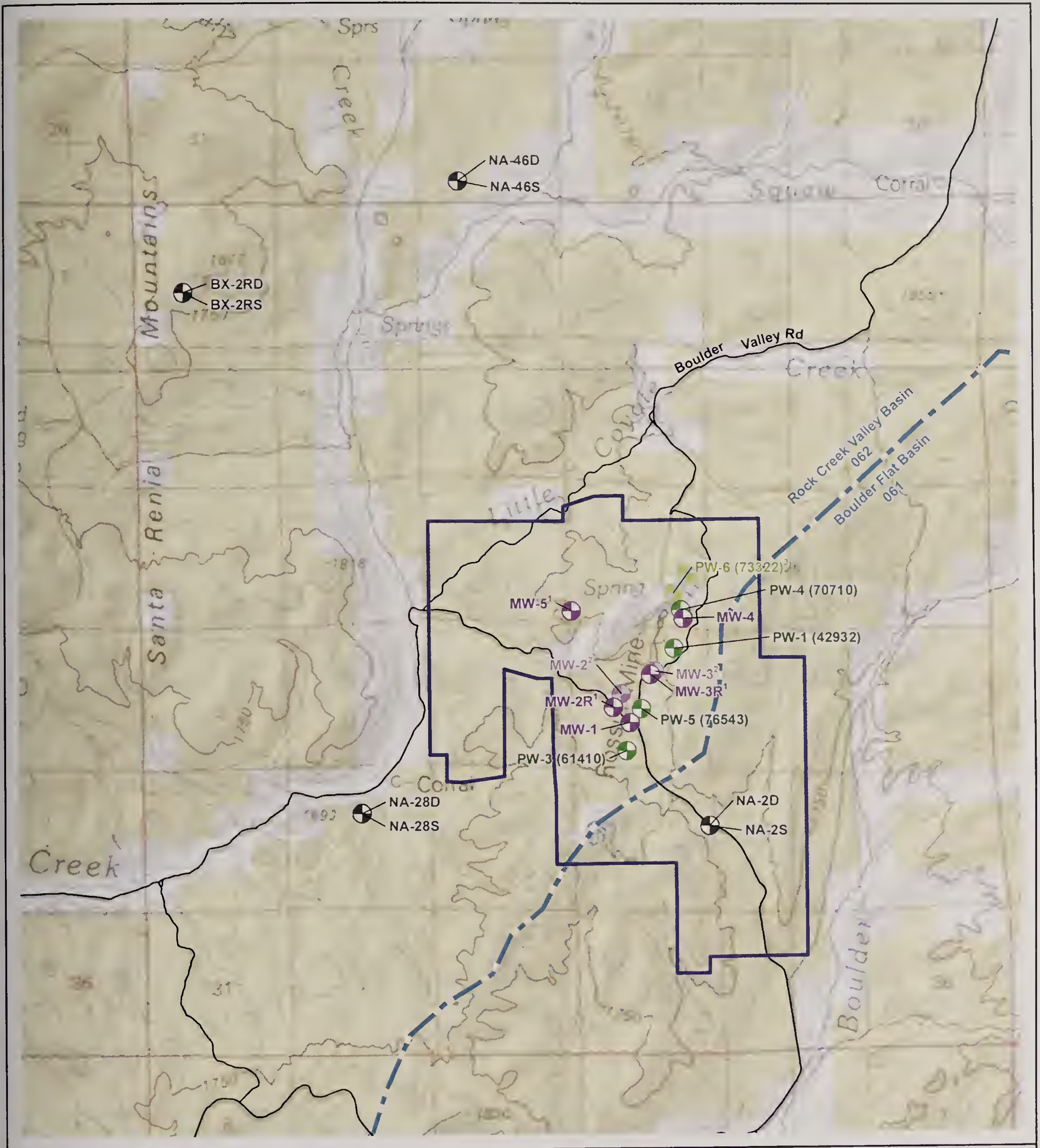
[1] Based on drilling and well completion logs.
[2] Depth to water, June 2015 (AECOM 2015d).
[3] Depth to water May 2014 (Golder 2014).
[4] Based on the monthly pumping rates for the 1st and 2nd quarters, 2015 reported to NDWR (HES 2015c) unless otherwise noted.
[5] MW-2 and MW-3 abandoned in June and July, 2015.
[6] MW-2R and MW3R completed in June 2015.
[7] PW-6 abandoned in April 2014.
[8] Depth to water reported at time of construction on NDWR logs.
[9] PW-6 not used for water production.
[10] PW-4 is no longer used for water production but is retained for groundwater monitoring (AECOM 2016a).
[11] Required monitoring frequency as per the WPCP, NEV2015112 (NDEP 2016a).
[12] Depth to water, March 2017 (AECOM 2017b)

In addition to the project monitoring wells, there are 4 sets of regional groundwater monitoring wells located within 3 miles of the proposed PoO boundary (**Figure 3.4-5**). These regional groundwater monitoring wells are part of the BVMP. Each of these well sets consists of two nested 2-inch standpipe piezometer (two piezometer casing strings in one borehole) designed to monitor the groundwater elevation at two different depths (i.e., shallow and deep). Well completion information and monitoring results for these wells are provided in the semiannual BVMP reports (BGMI 2015).

Groundwater Levels

The groundwater elevations in the northern Carlin Trend have been affected by regional drawdown resulting from large-scale dewatering activities at BGMI's Goldstrike Mine, located approximately 4 air miles south of the proposed PoO boundary (**Figure 3.2-1**). Mine dewatering for the Betze Pit at the Goldstrike Mine was initiated in 1990 and continues to date. The target dewatering elevation for the Goldstrike Mine was 3,576 feet amsl was reached in 2000 (BLM 2012a). Since that time, the mine dewatering operations have continued to maintain water levels at the approximate 3,576 amsl elevation. Groundwater pumping for mine dewatering at the BGMI facility is projected to continue until the end of 2021, and additional pumping for mine reclamation and mine processing activities would continue through 2034 (BLM 2012a).

BGMI has monitored water levels in the regional aquifer system in the Boulder Valley, and Rock Creek HAs since 1991 as a condition of their water rights permits (BGMI 2015). **Figure 3.4-6** shows the change in groundwater elevation (i.e., drawdown) since dewatering at the BGMI facility was initiated in 1990. Mine dewatering activities at the BGMI facility have resulted in lowering the groundwater levels approximately 1,700 feet within an approximately 2.5-mile-wide northwest-trending zone that extends from the Betze-Post Pit to near the center of the adjacent Arturo Mine Project. Based on the BVMP drawdown map for the end of the 3rd quarter of 2015, the estimated drawdown within the PoO area is estimated to range from approximately 300 feet near the south margin of the proposed PoO boundary to less than 10 feet in the central and northern portion of the PoO area. BVMP monitoring well NA-2 located in the southeast portion of the proposed project area (**Figure 3.4-5**) consists of a shallow and deep nested piezometer in one borehole. Monitoring indicates that groundwater elevations in the NA-2 shallow piezometer have declined approximately 21 feet, while the NA-2 deeper piezometer have declined 256 feet. Golder (2014) reviewed available groundwater elevation data for the site vicinity and determined that since 1990, groundwater levels located north of the Stock Pond have not been affected by drawdown; while water levels south of the Stock Pond have been affected by regional drawdowns with declines of up to 256 feet (Golder 2014). The monitored depth to groundwater recorded from the wells on site (**Table 3.4-4**) ranges from approximately 56 to 860 feet bgs.



Tuscarora Field Office

Elko District Office

Elko

Reno

Las Vegas

Proposed Project Boundary

Hydrographic Basin

Site Production Well (Active)

Site Production Well (Abandoned)

Site Monitoring Well (Active)

Site Monitoring Well (Abandoned)

Other Monitoring Well (Active)

Notes: [1] New Monitoring wells installed in June, 2015.
[2] Abandoned in June and July 2015; replaced with MW-2R and MW-3R.
[3] Abandoned in April 2014.

Source: SRK 2014a, NDWR 2015, Golder 2014.

Rossi Mine Expansion Project EIS

Figure 3.4-5

Production and Monitoring Well Locations

0 0.25 0.5 0.75 1 Miles

0 0.5 1 Kilometers

1:65,000

N

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notice.

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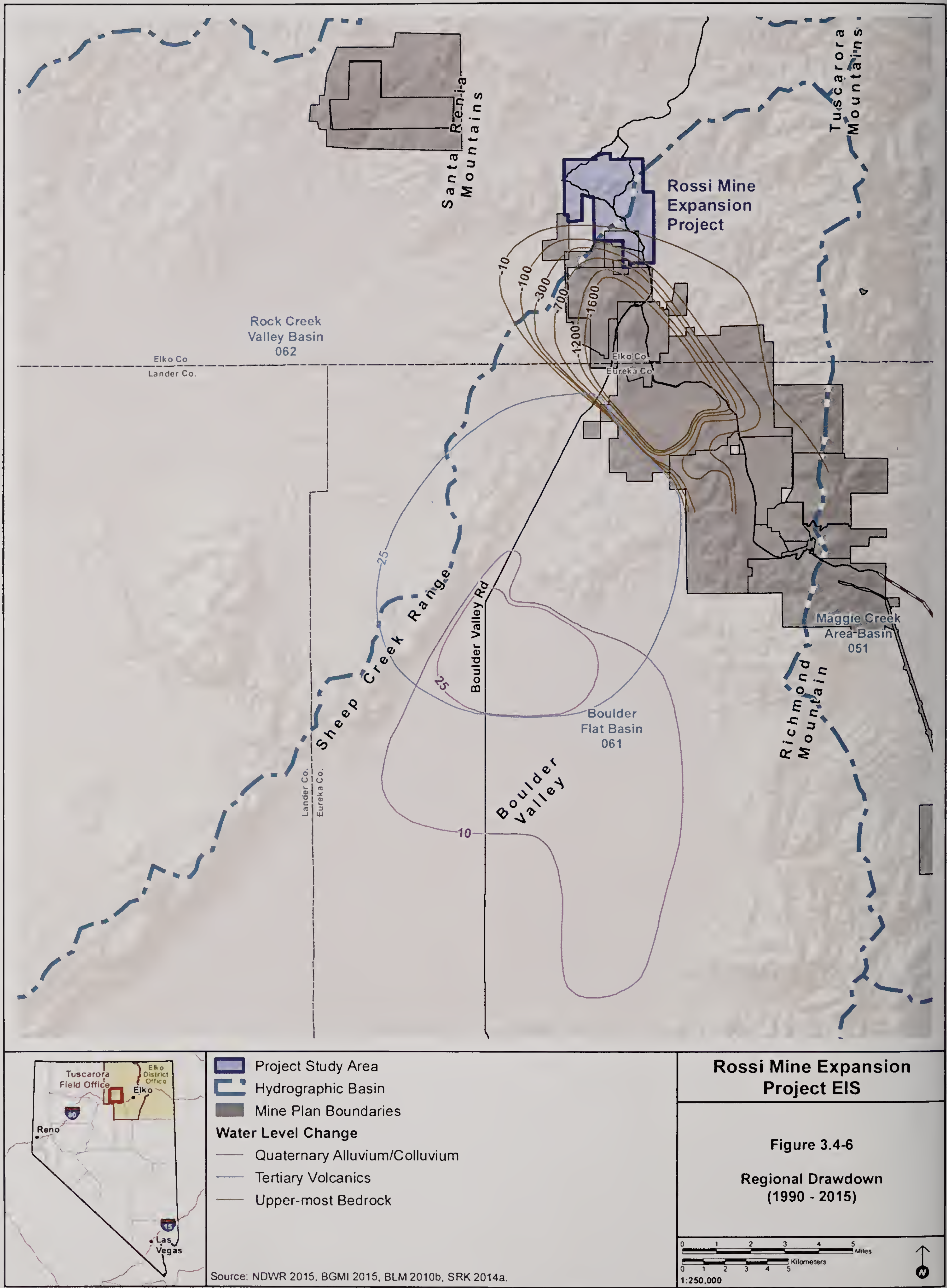


Rossi Mine Expansion Project EIS

Figure 3.4-6

Regional Drawdown (1990 - 2015)

10/12/2017

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notice.

The estimated regional groundwater elevation contours across the region as presented in the BVMP are shown on **Figure 3.4-7.** The estimated water level contours indicate that the regional groundwater elevations range from approximately 5,600 feet at the northeastern corner to approximately 4,800 feet in the southeastern portion of the proposed project area. The water level contours also indicate that the hydraulic gradient for the regional groundwater aquifer system slopes steeply from northeast to southwest across proposed project area. In contrast, the water level elevations in the area located about 1 mile south of the proposed project area indicate the hydraulic gradient in this area is essentially flat and equivalent to the water levels at the Betze-Post Pit located several miles south of the proposed PoO boundary.

Golder developed a groundwater elevation contour map for the proposed project area using the water level data from the Rossi monitoring wells that existed for the 2nd quarter of 2014 (MW-1, MW-2, MW-3, MW-4 and PW-4) and the BVMP monitoring wells located in the project vicinity (**Figure 3.4-8**) (Golder 2014). Their results indicate that the groundwater elevations contours developed using the additional Rossi monitoring wells shift the 5000 to 5400 elevation contours further to the northeast through the central part of the proposed project area compared to the BVMP contours. The Golder results also illustrate that there is a steep gradient to the southwest between MW-4 and MW-2.

3.4.1.4 Water Quality

Water Quality Standards

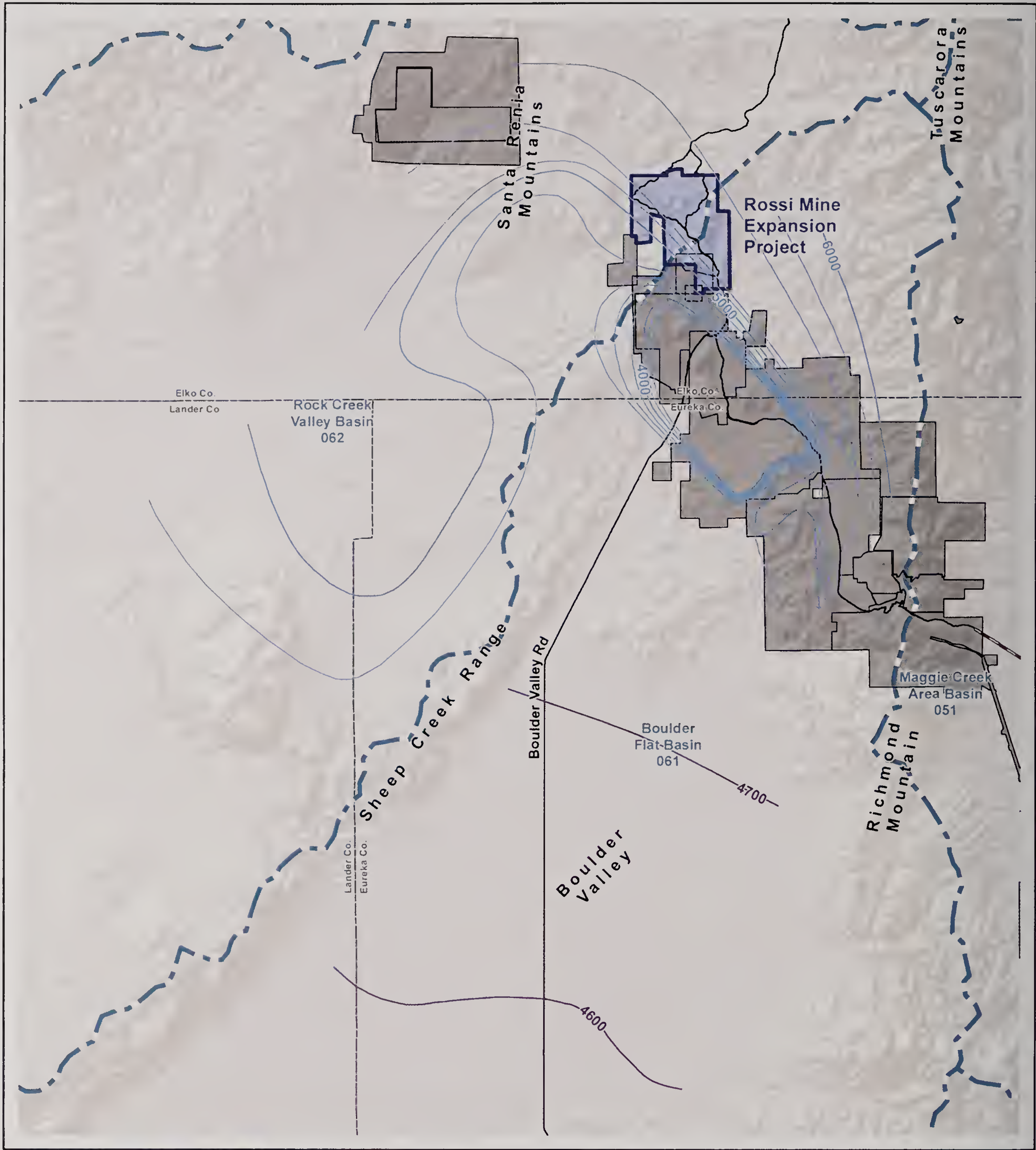
Waters of the State of Nevada are defined in NRS 445A.415 and include, but are not limited to: 1) all streams, lakes, ponds, impounding reservoirs, marshes, water courses, waterways, wells, springs, irrigation systems, and drainage systems; and 2) all bodies of accumulations of water, surface and underground, natural or artificial.

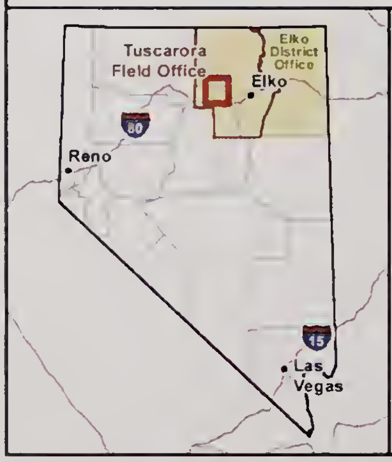
Water quality standards for state waters have been established by the State of Nevada under NAC. NAC 445A.453 establishes primary water quality standards, and NAC 445A.455 establishes secondary standards for water quality. General Nevada water quality standards are summarized in **Table 3.4-5**. Primary standards are based on the potential use of groundwater for drinking water and are established to protect human health; the secondary standards are for aesthetic qualities. These standards also are referred to as Maximum Contaminant Levels (MCLs). Because groundwater downgradient of the project has the potential to be used for drinking water, the Nevada drinking water standards would apply to mine-related activities that affect groundwater (NAC 445.424).

Surface water quality standards provided in **Table 3.4-5** are derived from the standards for designated water listed in NAC 445A.1236. These standards are intended to provide water quality thresholds to protect beneficial uses identified for specific water bodies or stream reaches and their tributaries. For example, beneficial uses for Rock Creek as identified by the State of Nevada in NAC 445A.1522, include livestock, irrigation and aquatic life. Under NAC 445A.1239, the standards for beneficial uses identified for Rock Creek in NAC 445A.1522 also apply to the watershed upstream that includes Antelope Creek. For the purpose of this evaluation, the surface water quality standards applicable to beneficial uses identified for Rock Creek are assumed for Boulder Creek and its tributaries.

Monitoring Requirements

The NDEP issued a WPCP (NEV2015112) for existing and proposed expansion of the Rossi Mine facilities on February 19th, 2016 (NDEP 2016a). The compliance monitoring requirements included in the WPCP are summarized in **Table 3.4-6** and include monitoring water quality in water supply wells, monitoring wells, seeps and springs, pond solutions, and Antelope Creek; and geochemical characterization of waste rock and mined processed materials, and pond sediments.





Project Study Area

Hydrographic Basin

Mine Plan Boundaries

Potentiometric Surface Elevation

Boulder Valley Alluvium

Tertiary and Paleozoic Rock

Source: NDWR 2015, BGMI 2015, BLM 2010b, SRK 2014a.

Rossi Mine Expansion Project EIS

Figure 3.4-7

Regional Groundwater Elevations (2015)

0 1 2 3 4 5 Miles

0 1 2 3 4 5 Kilometers

1:250,000

N

10/12/2017

Table 3.4-5. General Nevada Water Quality Standards

Constituent (mg/l)[1]	Groundwater		Surface Water			
	Nevada Drinking Water Standards		Municipal or Domestic Supply	Nevada Agriculture		Aquatic Life
	Primary MCL[2]	*Secondary MCL[2]*		*Irrigation*	*Livestock Watering*	
Physical Properties						
Dissolved Oxygen	--	--	Aerobic	--	Aerobic	5.0
Color (color units)	--	15[3]	75	--	--	--
Total Dissolved Solids (TDS) (at 180°C)	--	500[4]; 1,000[3]	500[4]; 1,000[3]	--	3,000	--
Turbidity (NTU)	--	--	--	--	--	--
Inorganic Nonmetals						
Ammonia (unionized) (Total NH_3 as N)	--	--	0.5	--	--	--
Chloride	--	250[4]; 400[3]	250[4]; 400[3]	--	1,500	--
Cyanide (as CN)	0.2	--	0.2	--	--	--
Fluoride	4.0	2.0[4]	--	1.0	2.0	0.0052[5]
Nitrate (as N)	10	--	10	--	100	--
Nitrite (as N)	1.0	--	1.0	--	10	--
pH (standard units)	--	6.5-8.5[3]	5.0-9.0	4.5-9.0	6.5-9.0	6.5-9.0
Sulfate	--	250[4]; 500[3]	250[4]; 500[3]	--	--	--
Metals[6]/Elements						
Aluminum	--	0.2[3]	---	--	--	--
Antimony	0.006	--	0.006	--	--	--
Arsenic (total)	0.01	--	0.01	0.10	0.20	0.18[5,7]
Barium	2.0	--	2.0	--	--	--
Beryllium	0.004	--	--	0.10	--	--
Boron	--	--	--	0.75	5.0	--
Cadmium	0.005	--	0.005	0.01	0.05	0.0006[5,8]
Chromium (total)	0.1	--	0.1	0.10	1.0	0.015[5,8]
Copper	1.3[9]	1.0[3]	--	0.20	0.50	0.0065[5,8]
Iron	--	0.3[4]; 0.6[3]	--	5.0	--	1.0
Lead	0.015[9]	--	0.05	5.0	0.10	0.0004[5,8]

Table 3.4-5. General Nevada Water Quality Standards

Constituent (mg/l)[1]	Groundwater		Surface Water			
	Nevada Drinking Water Standards		Municipal or Domestic Supply	Nevada Agriculture		Aquatic Life
	Primary MCL[2]	*Secondary MCL*[2]		*Irrigation*	*Livestock Watering*	
Magnesium	--	125[4]; 150[3]	--	--	--	--
Manganese	--	0.05[4]; 0.1[3]	--	0.2	--	--
Mercury	0.002	--	0.002	--	0.01	0.00012[5]
Nickel	0.1	--	0.134	0.20	--	0.087[5,8]
Selenium	0.05	--	0.05	0.02	0.05	0.005[5]
Silver	--	0.1[3]	--	--	--	0.0014[5,8]
Thallium	0.002	--	0.013	--	--	--
Zinc	--	5.0[4]	--	2.0	25	0.584[5,8]

Sources: 40 CFR 141.51; 40 CFR 143.3; NAC 445A.119, 445A.144, 445A.453, and 445A.455.

[1] Units are milligrams per liter (mg/l) unless otherwise noted.
[2] MCL = Maximum contaminant level. Federal primary standards that existed as of July 1, 2009, are incorporated by reference in NAC 445A.4525.
[3] Nevada secondary MCLs.
[4] Federal secondary MCLs.
[5] 96-hour average.
[6] The standards for metals and metalloids are expressed as total recoverable unless otherwise noted.
[7] Standard for arsenic (III); trivalent (reduced) inorganic form of arsenic, which occurs as a water soluble form.
[8] Standard is dependent on site-specific hardness; displayed value is based on a hardness of 60 mg/l as calcium carbonate. (See NAC 445A.144 for equations.)
[9] Value is the action level for lead and copper as defined by EPA regulation known as the Lead and Copper Rule (40 CFR Part 141 Subpart I).

Table 3.4-6. WPCP Compliance Water Quality Monitoring Requirements

	Sample Location	Parameters	Frequency
Water Supply / Production Wells	PW-1 PW-3 PW-4 PW-5 Barrick Dewatering Water	Profile I[1]	Annual
Monitoring Wells	MW-1 MW-2R MW-3R MW-4 MW-5	Profile I[1]	Quarterly
Seeps/Springs	SP-001 SP-002	Profile I[1]	Quarterly
Mined and Processed Materials	Ore Stockpile Jig Reject Product Waste Rock	Net Acid Generation Test pH, paste pH, Meteoric Water Mobility Procedure -Profile I[1] and Acid Neutralizing Potential/Acid Generating Potential	Quarterly
Pond Solution	Upper Pond Lower Pond Stock Pond	Profile I	Quarterly
Pond Sediment	Upper Pond Lower Pond Stock Pond	NAG pH, paste pH, MWMP-Profile I[1] and ANP/AGP	Semi-annual (Quarter 1 and 3)
Antelope Creek	(1) Upgradient of Upper, Lower, and Stock Ponds (2) Downgradient of Upper, Lower, and Stock Ponds	Surface Water Profile[1], temperature (°F), and flow (gpm)	Quarterly (when flow is present)

Source: NDEP 2016a.

[1] Sample constituents for Profile I and Surface Water Profile provided in NDEP 2016c.

Surface Water Quality

In general, surface water quality sampling is conducted quarterly at the Upper Pond, Lower Pond, Stock Pond, and SP-001 and SP-002 spring sites (**Figure 3.4-4**) in the proposed project area. Samples have not been collected at the Upper Pond and Lower Pond since the second quarter of 2016 due to temporary mine shutdown. Available water quality data for these surface water sampling sites with a comparison to the NDEP Profile I reference values are provided in Appendix E.

All constituents analyzed in surface water samples collected were in compliance with applicable water quality standards with the following exceptions. Water samples collected from the Upper Pond in the first and second quarter of 2016 had pH values of 8.65, and 8.58 respectively. Water samples collected from the Lower Pond in the first and second quarter of 2013 had pH values of 8.59, and 8.51, respectively. These values slightly exceed the Nevada secondary MCL for drinking water of 8.5 but do not exceed the pH standard of 9.0 for livestock watering and aquatic life.

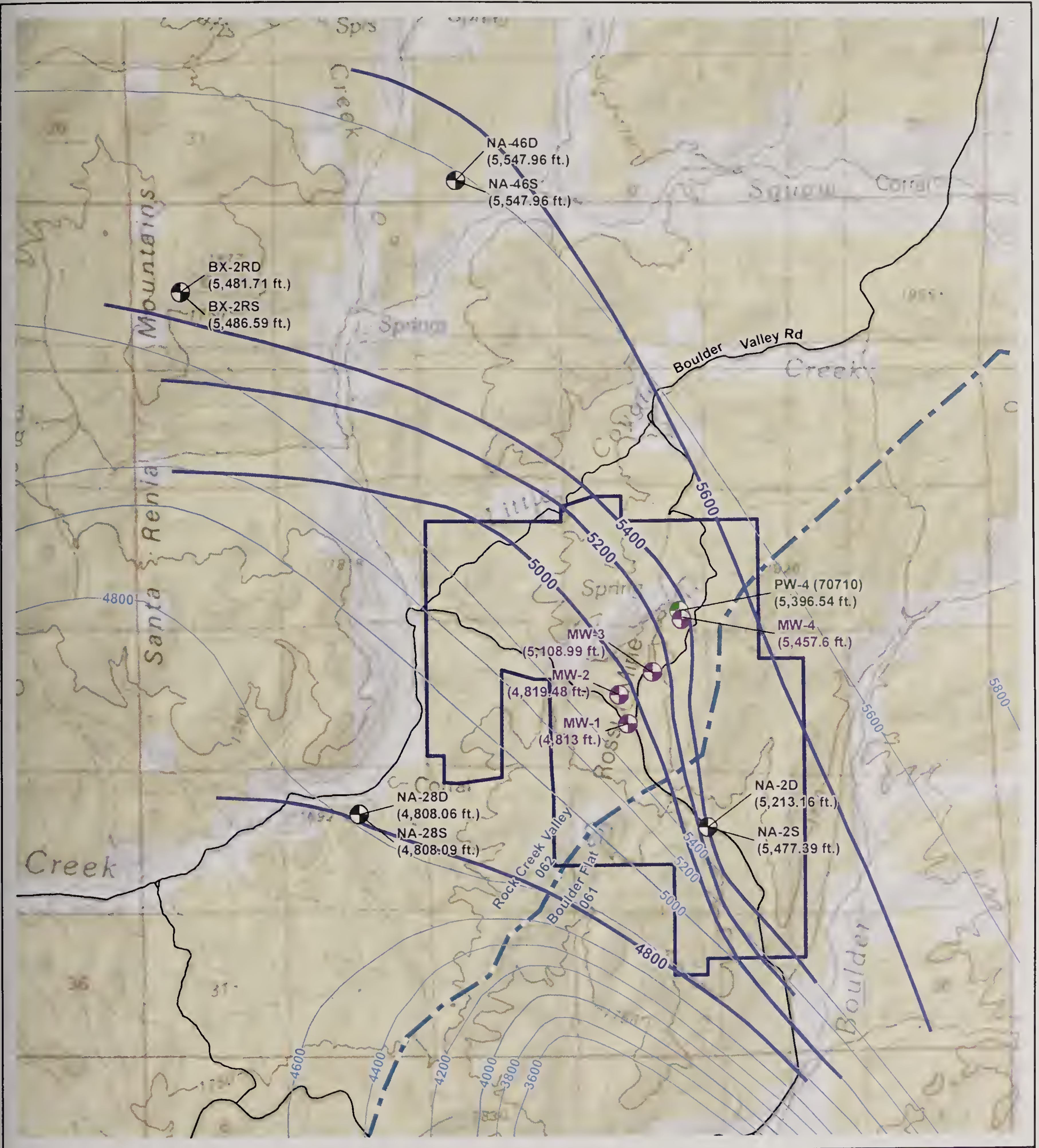
Water sampled from the Lower Pond in the 3rd and 4th quarters of 2012 had concentrations of dissolved aluminum of 0.26 mg/L and 0.31 mg/L respectively, that exceeded the federal secondary drinking water standard (0.2 mg/L) for aluminum. However, all samples collected from the Lower Pond, prior to, and

following the 3rd and 4th quarter of 2012 had concentrations of aluminum that were below the detection limit.

The pH measured in samples collected from the Stock Pond ranged from 6.48 to 10.33 standard units (s.u.). Water with a pH of <6.5, or >9.0 does not meet the water quality standard (6.5 to 9.0 s.u.) for livestock watering and aquatic life.

Samples collected from SP-001, and SP-002 have Nitrogen (Nitrate + Nitrite) concentrations that ranged from 10 to 18 mg/L, and 14 to 29 mg/L respectively. Nitrogen concentrations >10 mg/L exceed the water quality standard for livestock watering. The suspected source of nitrogen in the spring water is cattle that use both springs as noted by evidence observed during sampling events (SRK 2013c, SRK 2014a, AECOM 2015a, AECOM 2015e, AECOM 2015d).

Water quality samples are collected quarterly on Antelope Creek at site ANT-1, and Boulder Creek site BC-AA (**Figure 3.4-2**) as part of the BVMP. The water quality results presented in the most recently available BVMP report (2nd and 3rd quarter, 2015) indicate that the water quality constituents analyzed in the samples have levels that do not exceed the NDEP Profile water quality reference values (BGMI 2015).



Project Study Area	
Hydrographic Basin	
Site Monitoring Well (Active)[1]	
Other Monitoring Well (Active)[1]	
Site Production Well (Active)	

Estimated Groundwater Elevation Contours

- Golder 2014
- Boulder Valley Monitoring Plan

Tuscarora Field Office; Elko District Office; Elko; Reno; Las Vegas

Source: [1]Golder 2014, BGMI 2015, SRK 2014a.

Rossi Mine Expansion Project EIS

Figure 3.4-8

Project Area Groundwater Elevations

0 0.25 0.5 0.75 1 Miles
0 0.5 1 Kilometers
1:65,000

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data
Original data were compiled from various sources. This information may not meet National Map Accuracy Standards.
This product was developed through digital means and may be updated without notice.

10/12/2017

Groundwater Quality

Groundwater quality in the region is based on sampling conducted for the original Betze Project EIS (BLM 1991a, BLM 1991b) and from 61 wells sampled as part of the Betze-Screamer Pit Lake Study. In addition, 36 regional wells were selected to characterize the groundwater in the Boulder Valley alluvium and Tertiary volcanics (BGMI 2015). Appendix B, The Betze Pit Expansion Project, Draft Supplemental EIS, (BLM 2008a) presents the general groundwater chemistry for the major hydrostratigraphic units in the region.

There are three main hydrostratigraphic units that occur within the project study area: 1) marine carbonate rocks; 2) marine clastic rocks; and 3) older basin-fill deposits (i.e., Carlin Formation). The marine carbonate rocks contain a strong calcium-bicarbonate water type that is relatively low in sodium and sulfate; average total dissolved solids (TDS) are approximately 566 mg/l, and average pH is around 6.7 standard units. The marine clastic rocks in the region primarily contain calcium-magnesium-bicarbonate water with elevated sulfate and silica. The average TDS in this water are approximately 305 mg/l, and pH is approximately 7.6 standard units. The older basin-fill contains a calcium-bicarbonate water with silica and sulfate; average TDS are approximately 478 mg/l, and average pH is approximately 7.4 standard units (BLM 2012a).

Water quality sampling results for wells on site collected between September 2013 and June 2017 are tabulated in summary tables provided in Appendix E Water Quality Data (AECOM 2017c). The current groundwater monitoring well network currently consists of five monitoring wells (MW-1, MW-2R, MW-3R, MW-4, and MW-5) sampled quarterly, and four production wells (PW-1, PW-3, PW-4, and PW-5) sampled annually. The results of the water quality sampling from these wells were used to characterize the baseline groundwater quality for the project site. The water quality data indicates that samples from one or more of these wells exceeded the primary MCL for antimony and arsenic, and secondary MCL for aluminum, iron, manganese, and pH (**Table 3.4-7**). HES noted that the high pH levels observed in MW-2 and MW-3 were from well construction issues with cement contamination and not from mine operations. Other analyzed constituents did not exceed the primary or secondary MCLs. Comparison of the sample results for these seven wells indicates that the water quality in the bedrock wells has a low to moderate TDS ranging from 170 to 480 mg/L, and neutral to slightly alkaline pH ranging from 7.29 to 9.94 s.u.

Table 3.4-7. Groundwater Quality Summary for Project Monitoring Wells

Constituent (mg/L)[1]	Applicable Nevada Drinking Water Standards	MW-1	MW-2R	MW-4	PW-1	PW-3	PW-4	PW-5
		Range	*Range*	*Range*	*Range*	*Range*	*Range*	*Range*
Aluminum	0.05[3]-0.2[4]	<0.045 – 0.0087	0.0025 – 0.0038	<0.0019 – 0.020	<0.045	<0.045	<0.045 – **0.052**	<0.045
Antimony	0.006[2]	<0.0025 - **0.022**	<0.0005 - <0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
Arsenic	0.01[2]	<0.0050 - **0.02**	0.0066 - 0.0083	<0.0050	<0.0050	<0.0050 - 0.0064	<0.0050	<0.0050
Iron	0.3[4]; 0.6[3]	<0.010 - **1.0**	<0.018 - <0.050	<0.010 - **0.81**	<0.018 - **0.76**	<0.050 - 0.099	<0.010 - **0.63**	<0.010 - 0.066
Manganese	0.05[4]; 0.1[3]	0.07 - **0.13**	<0.0050	**0.14 - 0.28**	0.080 - **0.24**	<0.0050	<0.0050 - **0.21**	<0.0050 - 1.1
pH (standard units)	6.5 - 8.5[3]	7.71 - **9.08**	6.71 - 8.19	6.76 - 8.27	7.48 – 8.14	7.29 - 7.72	7.53 - **9.94**	7.35 - 7.64
Total Dissolved Solids (TDS)	500[4]; 1,000[3]	170 - 441	279 - 477	250 - 454	340 - 480	200 - 260	310 - 370	280 - 340
Number of Sampling Events[5]		19	8	19	14	14	14	6

Source: AECOM 2017c.

[1] Units are milligrams per liter (mg/l) unless otherwise noted.
[2] MCL = Maximum contaminant level. Federal primary standards that existed as of July 1, 2009 NAC 445A.4525.
[3] Nevada secondary MCLs.
[4] Federal secondary MCLs.
[5] Number of samples excludes duplicate.

Results in **BOLD** indicate exceedance of one or more drinking water standards.

3.4.1.5 Rock Geochemistry

Mining operations bring mineralized rocks from depth, where they are stable, to the surface, where they react with air and water and potentially release metals and other solutes. Sulfide minerals, in particular, undergo oxidation reactions, resulting in acid sulfate and metal-bearing solutions, commonly referred to as acid rock drainage. The potential of mined rock to affect contact water within the proposed project area was assessed by conducting standard geochemical tests on representative samples to evaluate both the acid rock drainage and metal leaching risk.

Characterization of waste rock, ore, and jig byproducts at the site was described in the *Geochemical Characterization Report for the Rossi Mine* (SRK 2014e). This report is included as an appendix to the PoO and is available for review at the BLM Elko District Office. An overview of the geology and barite mineral occurrence is provided in Section 3.3, Geology and Minerals. Geologic information and exploration drilling results indicate that the main lithologies in the proposed mine expansion areas, include the following:

1. Alluvium – alluvial material consisting of poorly sorted sediments. Includes alluvial material salvaged and stockpiled for use as growth media during reclamation.
2. Barite (ore) – medium dark gray, massive, fine-grained barite beds within the Slaven Chert.
3. Chert – gray to grayish brown, thinly bedded argillite, shale and chert (Slaven Chert).
4. Tuff – red to gray volcanic tuff unit of the Tertiary Carlin Formation.
5. Intrusive – Light tan to orange tertiary igneous intrusive mainly occurs as thin, clay altered units that intrude the Slaven Chert unit.
6. Fault Gouge – rare zones of red, friable clay with angular clasts of chert and barite.

The proposed project would generate approximately 143.5 million tons of additional waste rock material that would be placed in the King North Expansion, QLC East, QLC North, and Dawn WRDFs. The estimated percentages of waste rock that would be generated during the proposed mine expansion is provided in **Table 3.4-8**. The estimated percentages of material for the Dawn Pit are assumed to be the same as the QLC Pit because of similar lithologies at both locations (SRK 2014e). An estimated 95 percent of the waste rock from the King Pit, and 80 percent of the waste rock from the QLC and Dawn Pits consist of chert bedrock material that has undergone extensive oxidation. Unoxidized chert is typically dark gray to black and has visible sulfide minerals ranging from a trace to 1 percent of the rock and no carbonate. Although unoxidized chert was included in the geochemical characterization program, this material occurs below the depth of the floor of the pits and therefore, would not be mined under the Proposed Action or the Reconfiguration Alternative.

Table 3.4-8. Potential Waste Rock Material Types

Rock Type	Oxidation	Estimated Percentage of Waste Rock		
		King Pit	*QLC Pit*	*Dawn Pit*[1]
Alluvium	Oxide	5	5	5
Chert	Oxide	95	80	80
	Non-oxide[2]	<1	<1	<1
Tuff	Oxide	<1	5	5
Intrusive	Oxide	<1	10	10
Fault Gouge	Oxide	<1	<1	<1
Total		**100**	**100**	**100**

Source: SRK 2014e.

[1] Percentages for the Dawn Pit are assumed to be the same as the QLC Pit because of similarities lithologies.
[2] Occurs below the depths of the proposed pits, and would not be mined under the Proposed Action.

Representative samples of ore, overburden, waste rock and jig byproducts were collected as part of the geochemical characterization program. Samples collected included 27 samples from exposed pit walls, waste rock disposal facilities, ore stockpiles, tailings areas; and, 25 samples of core material from exploration drillholes located within the proposed QLC Pit. Specific sample locations are identified in the Geochemical Characterization Report (SRK 2014e).

A series of standard geochemical tests were conducted on samples of the barite ore, jig byproducts and waste rock material from the study area. **Table 3.4-9** lists the number of samples tested for each material type. These tests included multi-element analysis (i.e., whole-rock chemical analyses), acid-base accounting (ABA), net-acid generation (NAG), meteoric water mobility procedures (MWMP) and humidity cell tests (HCTs). Whole-rock chemical analyses measure the concentrations of constituents in the rocks and indicate potential sources of constituents of concern. ABA and NAG tests indicate whether waste rock is a likely net producer or consumer of acid that is generated by sulfide oxidation. The MWMP and HCT tests are short-term, and long-term tests, respectively, that are designed to evaluate constituent concentrations in leachate generated by water-rock interactions.

Table 3.4-9. Sample and Testing Frequency for Each Material

Category	Material Type	Sample Frequency			
		Multi-element	*ABA/ NAG*	*MWMP*	*HCT*
Ore	Queen Pit ore	5	5	2	1
	Crushed ore	3	3	3	1
	Jig ore	2	2	2	0
Jig By-products	Jig waste	3	3	3	1
	Jig tails (fines)	3	3	3	1
Waste Rock/ Overburden	Alluvium	1	1	1	0
	King waste	10	10	10	2
	Queen waste	35	35	3	5
Total		**62**	**62**	**27**	**11**

Source: SRK 2014e.

Acid-base Accounting

ABA testing is a widely used screening tool for discriminating rocks with the potential to generate acid by reacting with air and water from rocks that have the potential to consume acid. Acid-base accounting is based on determinations of the acid-generating potential (AGP), which is a function of the amount of sulfide minerals in a rock, and the acid-neutralization potential (ANP), which is a function of the amount of carbonate minerals in a rock. The AGP and ANP are determined in static tests and expressed in terms of kilograms calcium carbonate ($CaCO_3$) per ton of rock (kg $CaCO_3$/t). The difference between the ANP and the AGP is called the net neutralization potential (NNP).

The ratio of ANP to AGP (i.e., Neutralization Potential Ratio [NPR]) can be used to access the acid generation potential. If the NPR is 1:1(or less), the material is more likely to generate acid; whereas, if the ratio is 3:1 (or greater), the material is unlikely to generate acid (USEPA 1994). Another method to classify acid generating potential of rocks materials uses the NNP where materials with values of NNP > 20 kg $CaCO_3$/t are considered non-acid generating; NNP <-20 kg $CaCO_3$/t are considered acid generating; and values of NNP +20 to -20 kg $CaCO_3$/t are considered uncertain. To deal with the uncertainties of the static test, the BLM requires HCT tests for any material where the NNP does not exceed +20 kg $CaCO_3$/t and/or the ANP to AGP ratio is 3:1 (or less) (BLM 2008c).

The ABA was determined using the Nevada Modified Sobek Procedure (NDEP 2015d). The results of the ABA testing are provided in the Geochemical Characterization Report that is available for in-person review upon request of the BLM (SRK 2014e). In summary, only three out of the 62 samples meet the BLM criteria for acid neutralizing material. The remaining samples have limited neutralization capacity and have either an uncertain potential for acid generation or are classified as potentially acid generating (PAG). Samples of alluvium and waste rock from the King and Queen Lode pit areas have NNP values between -20 and 20 kg $CaCO_3$/t and ANP/AGP ratios of less than 3. The exceptions to this are two samples of waste rock that show a higher potential for acid generation with NNP values just below -20 kg $CaCO_3$/t and NPR values of less than 1. These samples consist of unoxidized, carbonaceous chert from the Queen Lode Complex. Samples containing barite (i.e., ore, crushed ore and jig by-products) all show a higher potential for acid generation from the ABA results with NNP values less than -20 kg $CaCO_3$ /t.

SRK (2014e) reviewed the results of the ABA tests and noted that the ABA results are not consistent with the descriptions of the samples. Specifically, SRK concluded that visible sulfide minerals only occur in the unoxidized chert samples. Due to the presence of $BaSO_4$ the classification methods using the results of the ABA tests give an incorrect interpretation of the acid generating potential. Barite is a non-acid

generating sulfate mineral that undergoes incomplete dissolution and extraction in the ABA tests and can result in an incorrect interpretation of the ABA data. As a result, the occurrence of barite in the samples results in an overestimation of the sulfide sulfur and acid generation and result in a “false positive” in the ABA test. Therefore, the occurrence of barite in the samples tends to limit the usefulness of the ABA tests for characterizing waste rock, ore and jig byproducts. This conclusion is confirmed by the NAG results and HCT results summarized below.

Net Acid Generation Tests

The NAG test is another screening level test used to classify the acid generating potential of a sample. The NAG test involves reaction of a sample with hydrogen peroxide to rapidly oxidize any sulfide minerals contained within a sample. The NAG testing procedure is described in the Geochemical Characterization Report (SRK 2014e). During the NAG test, acid generation and acid neutralization reactions can occur simultaneously. Therefore, the end result represents a direct measurement of the net amount of acid generated by the sample.

NAG tests were conducted on 62 samples to further evaluate the acid generation potential given complete oxidation of sulfide minerals in the samples. The results of the NAG test predict that the majority of the samples are non-acid producing. The exceptions to this are waste rock samples from the Queen Lode Complex consisting of unoxidized chert and one sample of oxidized chert. These samples show a moderate to high potential for acid generation. All other Rossi waste rock, ore and jig products are not predicted to generate acid with NAG pH values greater than 4 s.u. (SRK 2014e).

Meteoric Water Mobility Procedure Testing

MWMP testing simulates conditions under which infiltrating precipitation (rainwater and snowmelt) may leach constituents present in the waste rock. MWMP tests were conducted on 27 samples of ore, jig byproducts, and waste rock as listed on **Table 3.4-10**. The MWMP testing procedure is described in the Geochemical Characterization Report (SRK 2014e). In summary, the test procedure consists of placing 5 kilograms of rock fragments less than 5 centimeters in diameter in a plastic column. Five liters of water with a pH from 5.6 to 6.0 are then delivered to the column over 24 hours. The water passing through the rocks in the column was collected and analyzed for chemical composition.

The analytical results from the MWMP tests were compared with the NDEP reference values, which are based on the maximum contaminant levels allowed for drinking water for Nevada (**Table 3.4-10**). This comparison is useful to evaluate if there is a potential for rainwater to leach the oxide rocks at concentrations great enough to exceed established water quality standards.

The results of the MWMP tests indicate that average pH for the materials ranged from 6.1 to 7.4 s.u. With exception of aluminum, arsenic, manganese, and mercury, constituent concentrations released were below the NDEP reference values. Aluminum concentrations exceeded the 0.2 mg/L NDEP reference value (which is the Federal secondary MCL) in leachate derived from samples of crushed ore, topsoil, and King Pit waste rock. The average concentrations of arsenic (0.012 mg/L) and manganese (0.12 mg/L) from jig tails slightly exceeded their respective NDEP reference values (0.01 mg/L arsenic [primary MCL]; 0.1 mg/L manganese [secondary MCL]). The average concentration of mercury (0.0051 mg/L) in leachate generated from waste rock from the QLC pit waste rock exceeded the NDEP reference values (0.002 mg/L), which is the primary MCL for drinking water.

Table 3.4-10. Average Meteoric Water Mobility Results for Representative Materials

Constituent	NDEP Reference Value	Queen Pit Ore n=2	Crushed Ore n=3	Jig Ore n=2	Jig Waste n=2	Jig Tails n=3	Topsoil n=1	King Waste Rock n=10	Queen Waste Rock n=3
Alkalinity	-	2.3	6.5	6.2	16	66	34	9.2	11
Aluminum	0.2	<0.045	**0.21**	<0.045	0.097	<0.045	**0.71**	**0.5**	0.067
Antimony	0.006	<0.0025	<0.0025	<0.0025	<0.0025	0.0026	<0.0025	<0.0025	<0.0025
Arsenic	0.01	<0.005	0.0064	0.0054	0.006	**0.012**	0.0099	0.0097	0.0085
Barium	2	0.75	0.43	0.38	0.2	0.091	0.19	0.091	0.36
Beryllium	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	-	<0.1	<0.1	<0.1	<0.1	0.11	0.19	<0.1	<0.1
Cadmium	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Calcium	-	1.3	3.5	5.3	8.4	47	14	3.8	14
Chloride	400	<1	1.1	4	3.8	15	3.4	1.8	26
Chromium	0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Copper	1.3	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Fluoride	4	<0.1	0.37	0.52	0.7	1.9	0.39	0.8	2
Iron	0.6	<0.01	0.047	<0.05	0.036	<0.05	0.43	0.17	0.028
Lead	0.015	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
Magnesium	150	<0.5	0.74	1.3	1.8	12	3.7	0.99	3.6
Manganese	0.1	<0.005	0.0055	0.009	0.0068	**0.12**	<0.005	0.0086	<0.005
Mercury	0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00022	**0.0051**
Nickel	0.1	<0.01	<0.01	<0.01	<0.01	0.011	<0.01	<0.01	<0.01
Nitrate as N	10	<1	<1	<1	<1	5.4	3.9	1	3.5
Nitrite as N	-	<0.025	0.026	0.029	0.027	0.11	0.11	0.04	0.87
pH	6.5-8.5	**6.1**	**6.4**	6.5	6.7	7.4	7.02	6.5	6.5
Potassium	-	<0.5	2.1	3.1	2.6	7.2	7.6	2.1	2.5
Selenium	0.05	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Sodium	-	0.52	1.8	3.7	4.4	35	13	5.4	15
Sulfate	500	2.6	8	15	17	130	29	11	19
Thallium	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
TDS	1000	<10	28	49	72	370	210	67	170
Zinc	5	<0.01	<0.01	<0.01	<0.001	<0.01	<0.01	0.01	<0.01

Source: SRK 2014e.

All values reported in mg/L. <denotes less than the specified method detection limit.

Values in **BOLD** are above or below the respective NDEP reference values.

Humidity Cell Tests

HCTs are designed to estimate the maximum rates of acid generation and metals released from rocks caused by exposure to air and water. Humidity cell tests were conducted on 11 samples for a duration that ranged from 48 to 73 weeks (**Table 3.4-11**). The samples selected for testing included 5 samples identified as waste rock from the QLC, and 2 samples of waste rock from the King Pit, 2 samples of jig byproduct, and 2 samples of barite ore. Two of the samples from the QLC were described as “unoxidized chert with pyrite”. All of the other 5 waste rock samples were oxidized rock (4 chert and 1 intrusive rock sample) that did not have visible pyrite. The final pH values for all but one of the samples (discussed below) ranged from 6.13 to 7.04 and were considered circum-neutral (i.e., nearly neutral).

One of the 11 samples produced strong acidic leachate (pH of 2.1 to 2.9 s.u.) over the entire test period. This sample was described as “unoxidized chert with pyrite.” The acidic leachate generated from this sample also had high concentrations of trace metals. These results were consistent with both the ABA and NAG test results that indicated that the sample would generate acid. It is important to note that although the geochemical characterization included this material (i.e., “unoxidized chert with pyrite”) in the testing program, the depth of mining included within the proposed mine plan would not extend into the unoxidized rock material (SRK 2014e).

Test results for the 4 samples of oxidized chert had circum-neutral leachates throughout the test; and, concentrations of trace metals were below the NDEP reference values with the exception of exceedances of aluminum, arsenic and iron in one or more of the cells. The NDEP reference values for aluminum and iron are equivalent to the secondary standards (i.e., MCLs) for public water systems in Nevada. SRK attributed the elevated concentrations of aluminum and iron to the sedimentary nature of the deposit and presence of clay-sized particles that can pass through a 0.45 um filter (SRK 2014e).

A single sample of intrusive rock from the QLC area generated neutral to mildly alkaline leachates (pH 7 to 7.7 s.u.) and low potential for metals release. The exceptions to this are the same as noted for the oxidized chert samples.

Two representative samples of jig byproduct (waste and tailings), and two samples of barite ore produced circum-neutral to mildly alkaline leachate through the test duration and exhibited low associated metal release (SRK 2014e).

The HCT results indicate that the NAG test is a better screening tool for predicting acid leach risk for waste rock for the project. In contrast to the ABA tests, samples that were predicted to be non-acid forming, or showed a lower capacity for acid generation in the NAG test were non-acid generating in the HCT (**Table 3.4-11**) (SRK 2014e).

Table 3.4-11. Humidity Cell Test Results Summary

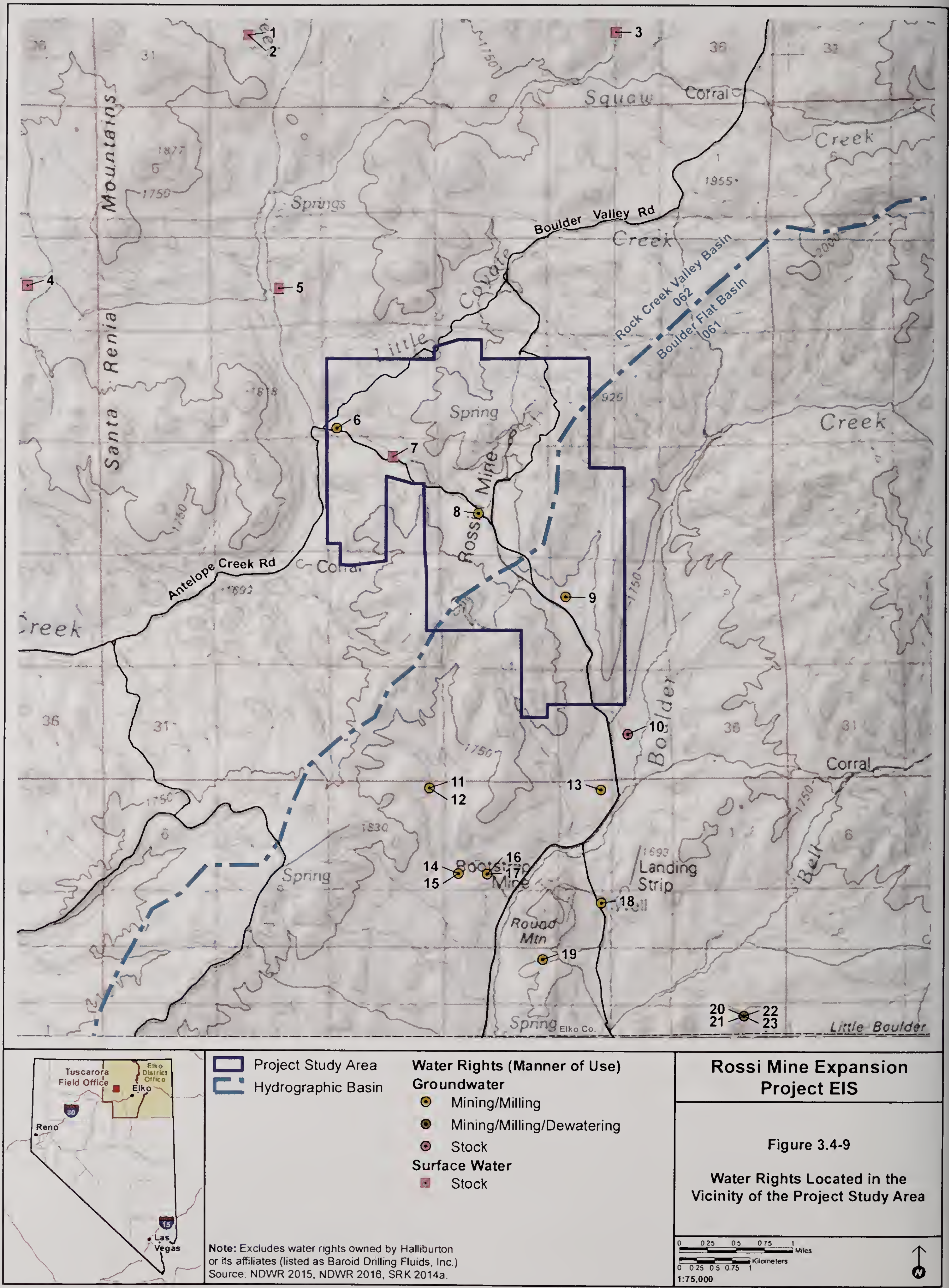
Cell	Sample Category	Material Type	Sample Name	NNP (kg $CaCO_3$/t)	NPR	AP Defined by ABA	NAG pH (s.u.)	NAG (kg H_2SO_4 /t)	AP Defined by NAG	Final HCT pH (s.u.)	Final HCT Conditions	HCT Status
1	Ore	Barite	J-2	-100	0.01	PAG	5.6	0	Non-PAG	6.72	Non-Acid	Terminated at week 73
10		Barite	QLE-7 406-423	-100	0.01	PAG	5.4	0	Non-PAG	6.52	Non-Acid	Terminated at week 48
2	Jig By-products	Jig waste	J-5	-70	0.02	PAG	5.2	0	Non-PAG	6.64	Non-Acid	Terminated at week 73
3		Jig tails	J-8	-70	0.05	PAG	6.6	0	Non-PAG	6.65	Non-Acid	Terminated at week 73
5	Waste Rock – King Pit	Chert	RW-4	-6	0.05	Uncertain	5.5	0	Non-PAG	6.67	Non-Acid	Terminated at week 73
6		Chert	RW-7	0.5	1.7	Uncertain	5.9	0	Non-PAG	6.65	Non-Acid	Terminated at week 73
4	Waste Rock – Queen Lode Complex	Chert	QP-5	-9	0.26	Uncertain	5.7	0	Non-PAG	6.56	Non-Acid	Terminated at week 73
7		Chert	QLE-1 204-222	6.8	8.6	Uncertain	5.1	0	Non-PAG	6.59	Non-Acid	Terminated at week 48
11		Chert w/ pyrite	QLE-7 670-688	6.8	2.2	Uncertain	3.6	4.5	Low-PAG	6.13	Non-Acid	Terminated at week 52
8		Chert w/ pyrite	QLE-2 588-610	-20	0.08	PAG	2.5	33	PAG	2.89	Acid	Terminated at week 48
9		Intrusive	QLE-7 234-244	1	3.3	Uncertain	8.3	0	Non-PAG	7.04	Non-Acid	Terminated at week

ABA Criteria	PAG	NNP<-20 kg $CaCO_3$/t or NPR<1
	Uncertain	NNP between -20 and +20 kg $CaCO_3$/t or NPR between 1 and 3
	Non-PAG	NNP>20 kg $CaCO_3$/t or NPR >3
NAG Criteria	PAG	NAG >10
	Low-PAG	NAG between 1 and 10
	Non-PAG	NAG <1
HCT Criteria	Acid	pH <5 s.u.
	Non-acid	pH >5 s.u.

Source: SRK 2014e.

3.4.1.6 Water Rights

An inventory of active water rights in the region surrounding the proposed project was used to identify the location and status of water rights within potentially affected areas. The inventory was based on water rights records on file with the NDWR (NDWR 2016). The inventory identified all active water rights located within the vicinity of the proposed project. For the purpose of the EIS analysis, all groundwater rights owned or controlled by HES and its affiliates were excluded from this summary. The locations of the points of diversion for the identified water rights in the project vicinity are shown in **Figure 3.4-9**; the owners, beneficial use, and annual duty for each water right are summarized in **Table 3.4-12**. Based on the NDWR database, there are a total of 23 active water rights in the inventoried area, which includes six surface water rights and 17 groundwater rights. All of the surface water rights are associated with springs used for stock watering. No public reserve water rights under the 1926 Executive Order, Public Water Reserve No. 107 were identified in the database within the inventoried area. The groundwater rights include 15 used for mining and milling, one used for mining, milling and dewatering, and one for stock watering.



Rossi Mine Expansion Project EIS

Figure 3.4-9

Water Rights Located in the Vicinity of the Project Study Area

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Table 3.4-12. Active Water Rights in the Project Vicinity

Map ID	Basin	Application	Status	Source	Type of Use	Priority Date	Duty (AFY)[1]	Owner of Record
1	62	0	Vested	Spring	Stock Watering		0.0	26 Ranch Inc.
2	62	0	Vested	Spring	Stock Watering		0.0	26 Ranch Inc.
3	62	0	Vested	Spring	Stock Watering		0.0	26 Ranch Inc.
4	62	0	Vested	Spring	Stock Watering		0.0	26 Ranch Inc.
5	62	27658	Certificate	Spring	Stock Watering	7/26/1973	16.1	26 Ranch Inc.
6	62	62577	Permit	Groundwater	Mining-Milling	11/12/1996	1448.0	Barrick Gold Exploration Inc.
7	62	0	Vested	Spring	Stock Watering		0.0	26 Ranch Inc.
8	62	62578	Permit	Groundwater	Mining-Milling	11/12/1996	1448.0	Barrick Gold Exploration Inc.
9	61	62579	Permit	Groundwater	Mining-Milling	11/12/1996	1448.0	Barrick Gold Exploration Inc.
10	61	0	Permit	Groundwater	Stock Watering	10/16/1992	6.1	Barrick Gold Exploration Inc.
11	61	57755	Permit	Groundwater	Mining-Milling	4/15/1982	645.2	Barrick Gold Exploration Inc.
12	61	57757	Permit	Groundwater	Mining-Milling	4/15/1982	645.2	Barrick Gold Exploration Inc.
13	61	58254	Permit	Groundwater	Mining-Milling	10/16/1992	1078.4	Barrick Gold Exploration Inc.
14	61	57882	Permit	Groundwater	Mining-Milling	4/15/1982	645.2	Barrick Gold Exploration Inc.
15	61	57883	Permit	Groundwater	Mining-Milling	4/15/1982	645.2	Barrick Gold Exploration Inc.
16	61	53715	Permit	Groundwater	Mining-Milling	4/15/1982	645.2	Barrick Gold Exploration Inc.
17	61	57756	Permit	Groundwater	Mining-Milling	4/15/1982	645.2	Barrick Gold Exploration Inc.
18	61	17233	Certificate	Groundwater	Mining-Milling	4/4/1957	80.7	Newmont Gold Company
19	61	26728	Certificate	Groundwater	Mining-Milling	5/17/1972	199.5	Newmont Gold Company
20	61	58354	Permit	Groundwater	Mining-Milling	8/3/1990	7239.8	Barrick Goldstrike Mines Inc.
21	61	59861	Certificate	Groundwater	Mining-Milling	3/25/1994	811.0	Barrick Goldstrike Mines Inc.
22	61	60786	Certificate	Groundwater	Mining-Milling	4/21/1987	2171.9	Barrick Goldstrike Mines Inc.
23	61	83823	Permit	Groundwater	Mining-Milling-Dewatering	8/3/1990	2172.0	Barrick Goldstrike Mines Inc.

Source: NDWR 2016.

[1] acre feet per year (afy)

3.4.2 Environmental Consequences

The primary issues related to water resources include: 1) impacts to groundwater and surface water quality from the construction, operation, and closure of waste rock storage facilities, and other mining and processing facilities; 2) reduction in surface water and groundwater quantities for current users and water-dependent resources from groundwater withdrawal from water supply wells; and 3) impacts from flooding, erosion, and sedimentation associated with mine construction, operation, or closure activities.

Under the Proposed Action, exploration would continue throughout the project area as described in Section 2.3.10, Exploration. Direct impacts to water quantity and quality within the project area resulting from exploration are anticipated to be minimal. No impacts to water rights and floodplains are anticipated to result from exploration activity. Surface disturbance from exploration would include short-term loss of approximately 67 acres throughout the project area. Locations of future exploration activity depend upon the results of drilling activity that has not yet been conducted; therefore, specific locations that would be impacted cannot currently be identified. Indirect impacts resulting from exploration activities would include increased fugitive dust, vibration, and localized soil compaction during road and pad construction and active drilling operations. Exploration would also result in an increase of fragmentation of the existing vegetation communities within the project area that could result in minor alterations of stormwater surface flows.

3.4.2.1 Proposed Action

Water Quantity Impacts

Under the Proposed Action, the estimated maximum water requirements would consist of 39.5 gpm for processing (jig plant) and 195 gpm for other uses (primarily dust suppression and drilling) for a total of 234.5 gpm (HES 2015c). The water supply for the proposed project would be provided by pumping existing and proposed new water supply wells located on-site; and continuation of trucking excess dewatering water from the neighboring Barrick Goldstrike Mine to the Rossi Mine as necessary. In 2015, the existing mine operation pumped water from three wells (Well PW-1, Well PW-3 and Well PW-5 in **Table 3.4-4** and **Figure 3.4-5**) at a combined rate of 43 gpm (HES 2015c). Pumping at these existing three wells would continue under the Proposed Action at the combined rate of approximately 43 gpm over the life of the project. In addition, three new wells would be constructed on site between 2018 and 2020 to meet the additional (i.e., 192.5 gpm) project water requirements. The planned depth, target aquifer, and yield for the three new wells required for the proposed project are provided in **Table 3.4-13**. The water rights required for these new wells would be subject to approval by the Water Rights Section of NDWR.

Under the Proposed Action, the groundwater pumping would be extended an estimated 8 years longer than required for the currently authorized activities included in the No Action alternative. The incremental increase in pumping attributable to the Proposed Action (compared to currently permitted operations included in the No Action Alternative) is 192.5 gpm.

Table 3.4-13. Proposed New Water Supply Wells

Proposed Well	Proposed Year Installed	Target Depth (ft)	Target Formation	Estimated Well Yield (gpm)	Estimated Annual Yield (gallons)	Required Permitted (acre-feet/year)
PW-7	2018	1000-2000	Marine Clastic Rocks	64	33,638,400	103.2
PW-8	2019	1000-2000	Marine Clastic Rocks	64	33,638,400	103.2
PW-9	2020	1000-2000	Marine Clastic Rocks	64.5	33,901,200	104
Total				**192.5**	**101,178,000 gallons/year**	**310.4**

Source: HES 2015c.

Impacts to Water Levels

As described in Section 3.4.1.3, Groundwater Resources, the currently active production wells (PW-1, PW-3 and PW-5) are completed in the marine clastic rock aquifer. The three proposed new production wells (PW-7, PW-8, PW-9) would also be completed in the same aquifer. The increased groundwater withdrawal that would occur from pumping the three new wells is anticipated to result in localized drawdown in the marine clastic aquifer. Because the marine clastic rocks have a low hydraulic conductivity ranging from 0.01 to 0.05 feet per day (MMA 1996a), and the pumping rates would be relatively low (i.e., < 64.5 gpm), it is reasonable to assume that the drawdown within this aquifer would be localized such that it would not likely extend outside the perimeter of the proposed PoO boundary. The depth to groundwater beneath the site measured in wells completed in the marine clastic aquifer ranges from approximately 237 to 860 feet bgs (**Table 3.4-4**). The substantial depth to water bgs indicates that the water table within the clastic rock aquifer is not connected to the surface water ponds or spring sites and associated perennial flow identified on site.

Impacts to Streams, Springs, Impoundments, and Seeps

As described in Section 3.4.1.2, Surface Water Resources, there are two perennial springs (SP-001, SP-002) identified within the proposed PoO boundary. Both springs emerge from the toe of existing WRDFs and support local perennial reaches in unnamed drainage areas downstream from the spring source. For the purposes of water resources impact analysis, the length of perennial stream supported by the spring discharge from SP-001 and SP-002 was assumed to be approximated by the length of the riparian herbaceous area mapped by EcoSynthesis (2013) and labeled as riparian zone as shown on **Figure 3.4-4**. This assumes that the areas mapped as riparian herbaceous are connected to, or dependent on the water source. Due to the monitored depth to groundwater in the marine clastic rock aquifer, and lack of interconnection between the springs, and the target production aquifer, localized drawdown from groundwater pumping is not expected to impact surface water flow at these springs; or any other perennial water sources located within or adjacent to the proposed project area.

Prior waste rock disposal on the north side of the King North WRDF apparently covered the original spring source for SP-001 and shifted the spring location downstream to its current mapped location. Expansion of the King North WRDF under the currently authorized activities included as part the No Action Alternative, would cover the current SP-001 spring source location shown on **Figure 3.4-4**, and approximately 1,230 feet of the downstream stream reach that appears to be supported by spring discharge as discussed in Section 3.4.2.4, No Action Alternative. The additional expansion of the King North WRDF included as part of the Proposed Action would not result in any additional impacts to SP-001 and its associated stream reach.

Expansion of the King South WRDF under the currently authorized activities included under the No Action Alternative, would continue to cover the drainage and flow from SP-002 spring source and approximately 967 feet of the stream reach that is apparently supported by spring discharge with waste rock as discussed in Section 3.4.2.4, No Action Alternative. This expansion of the King South WRDF was previously authorized in 1997. Under the Proposed Action, development of the QLC North WRDF would result in an increase in the impacts to stream reach apparently supported by discharge from the drainage and flow from SP-002. Specifically, the expansion of the footprint of the WRDF would increase the length of the stream reach covered by an additional 72 feet (for a total length of 1,039 feet of buried stream).

As described in Section 2.3.6 Waste Rock Disposal Facilities for the Proposed Action, trenched subdrain systems would be constructed to convey flow from the SP-001 and SP-002 spring source areas prior to expansion of the existing WRDFs footprints into these areas. The flow captured in the subdrain for drainage and flow from SP-001 would discharge into the existing unnamed drainage that drains the spring source area. Flow from the SP-002 would be routed to the proposed downgradient stormwater facility to prevent the seep water from entering the Proposed King Pit Expansion (HES 2016e).

Short reaches of unnamed ephemeral stream channels would be removed by proposed project components. These mostly occur in the footprint areas of the QLC North WRDF, QLC East, Dawn WRDF, and QLC Pit.

Watershed Impacts

Stormwater runoff from proposed facilities and disturbed areas would be captured in down-gradient diversion channels and routed into a series of sediment ponds as described in the stormwater control design report (SRK 2014c). The open pits are closed basins such that precipitation runoff within the boundaries of the open pits would be captured within the pits. Flow captured in the sediment ponds or in the proposed expanded open pit areas would not contribute to flow in Antelope Creek or Boulder Creek.

The nearest downstream monitoring station on Antelope Creek that captures all of the drainage area within the proposed PoO boundary is Station ANT-2 (**Figure 3.4-3**) located approximately 6 miles downstream (southwest). The watershed area located above Station ANT-2 is approximately 71,950 acres (112.4 square miles). Disturbance under the Proposed Action would essentially remove an additional 1,075 acres of the contributing watershed to Antelope Creek. The expansion of the removal of contributing watershed area affected by the Proposed Action represents approximately 1.5 percent of the Antelope Creek drainage located above Station ANT-2.

The nearest downstream monitoring station on Boulder Creek is Station BC-AA (**Figure 3.4-3**), located about 1.3 miles downstream from the proposed PoO boundary. Station BC-AA receives flow from the Boulder Creek headwaters. The watershed area above BC-AA is approximately 17,540 acres (27.4 square miles). The basin areas for the proposed project would affect the contributing watershed area of upper Boulder Creek. Under the Proposed Action, approximately 393 acres of contributing watershed area would be removed from the upper Boulder Creek drainage in the post-mining topographic configuration. The expansion of the watershed area affected by the proposed WRDFs would represent approximately 2.2 percent of the Boulder Creek drainage located above Station BC-AA.

The watershed areas affected by the drainage modifications resulting from the Proposed Action are drained by ephemeral streams. The overall impacts of these drainage modifications on flow quantities monitored at Antelope Creek (at ANT-2) and Boulder Creek (at BC-AA) would probably not be measurable.

Impacts to Floodplains

Potential impacts to floodplains and flood hydrology from the proposed project would be minimal. No federally delineated flood hazard zones have been identified within the proposed project area, and drainageways consist of narrow ephemeral channels. Stormwater drainage ditches and small catchments would be constructed to manage runoff in accordance with the NDEP and BLM requirements.

Impacts to Water Rights

For the purpose of this evaluation, all water rights owned or controlled by HES were excluded. Water rights located in the project study area are shown on **Figure 3.4-9**; and identified in **Table 3.4-12**. There are three groundwater rights (Map ID Nos. 6, 8 and 9) used for mining and milling, and one surface water right (Map ID 7) identified within the proposed PoO boundary. The locations of the three new groundwater supply wells included in the Proposed Action have not been determined. Depending on actual well locations, and the site specific aquifer properties, local drawdown associated with groundwater pumping may potentially affect existing groundwater rights. Impacts to wells could include a reduction in yield, increased pumping cost, or if the water level were lowered below the pump setting or the bottom of the well, make the well unusable. Specific impacts to wells would depend on the site-specific hydrogeologic conditions, well completion details, and timing of the drawdown.

The surface water right (Map ID 7) is listed as a spring source used for stock watering. However, water resource investigations on site have not identified a spring at or near this water rights location. Impacts to spring flow are not anticipated based on the depth to water in the marine clastic unit aquifer that is the target for water supply.

Potential Pit Lake Development

The expansion of open pit mining included under the Proposed Action would increase the footprints and depths of open pits at the mine as described in Section 2.3.5, Open Pits. The Proposed Action would also include partial or complete backfill of some expanded or new open pit areas (e.g. at the Dawn Pit). If the depth of one or more of the proposed pit(s) extends below the depth of the existing or pre-1991

groundwater elevation (that is expected to recover after mine dewatering ceases at BGMI) there may be potential for groundwater inflow to result in the development of a pit lake in one or more pits. In addition, there may also be a potential for the recovered groundwater elevation to intercept with backfill placed in pits resulting in groundwater flow through the backfill material.

The potential for groundwater to be intersected as the pit is deepened during active mining, for pit lake(s) to develop in the post-mining period, and for groundwater flow through pit backfill material was evaluated by comparison of the proposed ultimate pit shell configurations (including the lowest elevation of the pit floor) with recent and historic water level data collected in monitoring and water supply wells located within or near the footprint of the ultimate pit surface. This information was used to evaluate if there was a potential for the pit shell to intercept groundwater either during mining or after the groundwater elevations have fully recovered in the post-mining period.

A comparison of the maximum pit depths with the estimated existing and pre-dewatering groundwater elevations is provided in **Table 3.4-14**. For both the Queen Lode Pit and the Dawn Pit, the deepest portion of planned pits is situated at elevations that are 300 feet or more above the estimated existing and pre-dewatering groundwater elevations in the area. Therefore, this evaluation indicates that under the Proposed Action, groundwater (excluding localized perched zones that could be encountered during mining) is unlikely to be encountered during mining, or in the post-mining period in the Queen Lode Pit, and Dawn pits.

The limited groundwater data suggest that there is a potential for groundwater to be intercepted in the proposed expansion of the King Pit, and mining of the QLC Pit. Additional details regarding the proposed mining and groundwater elevation data in the vicinity of the King Pit and QLC Pit are summarized below.

Table 3.4-14. Pit Depth and Groundwater Elevation Summary (Proposed Action and Alternatives)

Alternative	Pit	Pit Crest Elevation[5]	Pit Floor Elevation (Deepest)	Estimated Maximum Depth[6]	Pit Backfill	Pit Floor Elevation (Deepest) After Closure	Estimated Existing Groundwater Elevation	Estimated Pre-Dewatering Groundwater Elevation	Potential for Pit Lake Development (Yes/No)	Potential for Groundwater Flow Through Pit Backfill Material (Yes/No)
		(feet amsl)	*(feet amsl)*	*(feet)*	*(Yes/No)*	*(feet amsl)*	*(feet amsl)*	*(feet amsl)*	*(Yes/No)*	*(Yes/No)*
No Action Alternative	King Pit	6,020	5,470	550	Yes (Partial)	5,470	5,420	5,420	No	No
Proposed Action/ Reconfiguration Alternative[1]	King Pit	6,020	5,325	695	Yes (Partial)[2]	5,325	5,420	5,420	Yes	Yes
No Action Alternative	Queen Lode Pit	6,100	5,800	300	Yes (Complete)	Backfilled	5,450	5,480	No	No
Proposed Action/ Reconfiguration Alternative[3]	Queen Lode Pit	6,100	5,800	300	Yes (Complete)	Backfilled	5,450	5,480	No	No
No Action Alternative	QLEE Pit	5,980	5,780	200	No	5,780	5,450	5,480	No	No
Proposed Action[1]	QLC Pit	6,060	5,285	775	No	5,285	5,450	5,480	Yes	No
Reconfiguration Alternative[1,4]	QLC Pit	6,060	5,285	775	Yes (Partial[4])	5,285	5,450	5,480	Yes	Yes
Proposed Action/ Reconfiguration Alternative[1]	Dawn Pit	6,015	5,800	215	Yes (Complete)	Backfilled	5,450	5,480	No	No

[1] Pit shell configuration would be the same under both the Proposed Action and Reconfiguration Alternatives.
[2] King Pit may be partially backfilled.
[3] No additional mining would occur at the Queen Lode Pit under the Proposed Action and Reconfiguration Alternatives.
[4] Partial backfill in the east lobe of the pit only.
[5] The pit crest elevation refers to the highest elevation of the pit crest at any point along the pit rim.
[6] Estimated by subtracting the deepest pit floor elevation from the maximum pit crest elevation as defined above.

King Pit

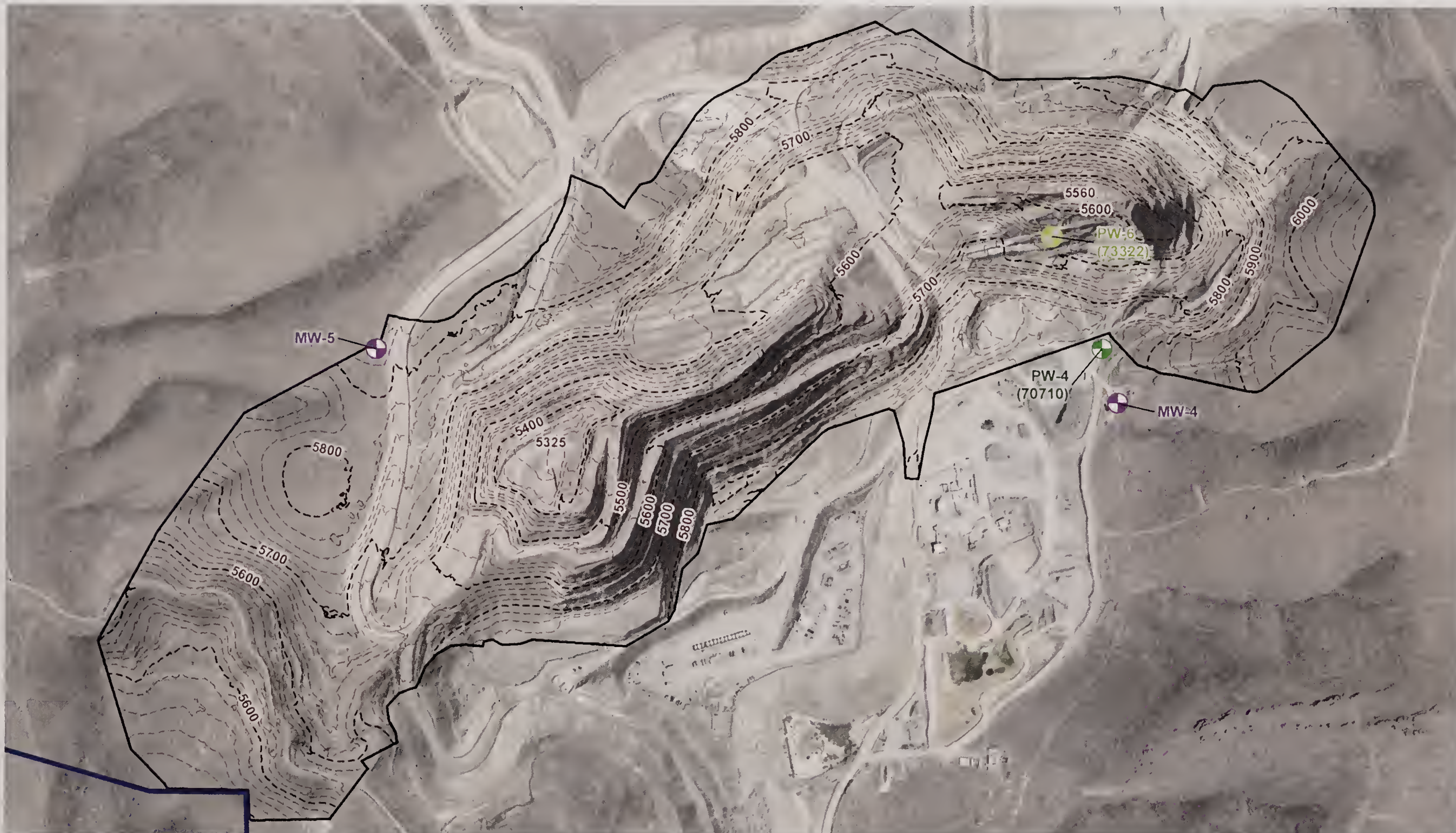
Under the Proposed Action, expansion of the King Pit would increase both the footprint and ultimate depth of the currently authorized open pit. The planned configuration of the ultimate pit surface of the King Pit at the end of Proposed Action mining is illustrated on **Figure 3.4-10**. For discussion purposes, the pit floor of the ultimate pit surface can be described as consisting of a west lobe with a floor elevation of 5,325 feet amsl; and an east lobe with a floor elevation of 5,560 feet amsl. Under the Proposed Action, the King Pit could be partially backfilled.

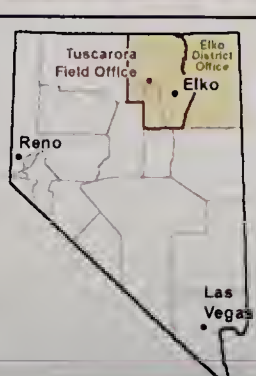
The potential for groundwater to be intersected as the pit is deepened during active mining and for pit lake(s) to develop in the post-mining period was evaluated by reviewing recent and historic water level data collected in monitoring and water supply wells located within or near the footprint of the ultimate pit surface. Review of available groundwater elevation data indicates that the pre-1991 regional groundwater flow is towards the southwest (Golder 2014). However, there is uncertainty currently regarding the existing groundwater elevation, and hydrogeologic conditions that would be encountered in the proposed pit footprint area.

The locations of existing or historic wells located within or near (within several hundred feet) the proposed pit footprint are shown on **Figure 3.4-10**. There are two active monitoring wells (MW-4, and MW-5), and a former water supply well (PW-4) that is currently used for monitoring purposes located in the vicinity of the King Pit. Another water supply well, PW-6, located within the east lobe of the pit was abandoned in 2014. Water level recordings are available for MW-4, PW-5, and PW-6. MW-5 located near the proposed western margin of the pit, was completed to a depth of 300 feet and did not encounter groundwater. The bottom of the casing for MW-5 is situated at an elevation of approximately 5,539 feet amsl, which is 214 feet above the proposed elevation of the floor of the west lobe (5,325 feet amsl). Because, MW-5 does not extend to the depth of the proposed maximum depth of the pit floor, it was not used to evaluate if the pit expansion could encounter groundwater or develop a pit lake(s) after closure.

The groundwater elevations recorded from MW-4, PW-4, and PW-6 compared to the planned deepest pit floor elevations of the west and east lobes of the King Pit are illustrated on the hydrograph in **Figure 3.4-11**. There is only one water level available for PW-6. The water level recorded for PW-6 is several hundred feet higher than those recorded at MW-4 and PW-4 which suggest that the recorded water level is from a localized perched zone and is therefore, not considered to be representative of the more regionally extensive groundwater system monitored in MW-4 and PW-4. MW-4 and PW-4 are both completed in black chert that is assumed to be part of the Slaven Chert Formation. PW-4 was originally installed as a production well in 2012 but pumping records for 2013, 2014, and 2015 indicate that this well has not been used as a water supply well over this period.

MW-4 and PW-4 are located near the southeast margin of the proposed perimeter the King Pit; and, PW-4 is located approximately 300 feet north of MW-4 **(Figure 3.4-10).** The water level measurements for MW-4 and PW-4 are available over the September 2013 to June 2016 period. The water level data from MW-4 and PW-4 are assumed to provide the best available information on the groundwater conditions in the vicinity of the King Pit because of their close proximity to the pit and the fact that the wells are completed in the same hydrogeologic unit that would be exposed in the lower portions of the pit. These water level recordings from MW-4 and PW-4 indicate that 1) the elevation of the groundwater surface is consistently higher at MW-4 (ranging from approximately +44-to +67-ft higher) compared to PW-4; 2) the water levels from MW-4 and PW-4 both exhibit similar trend lines showing a gradual increase in groundwater elevations over this period (+10.05 feet at MW-4; and +33.23 feet at PW-4); and 3) the water levels in both wells do not appear to be affected by drawdown associated with mine dewatering activities at BGMI.





Proposed Project Boundary
Site Production Well (Active)
Site Production Well (Abandoned)
Site Monitoring Well (Active)

King Pit
Ultimate Pit Surface Elevation
100' Contour Interval
20' Contour Interval

Source: Golder 2014.

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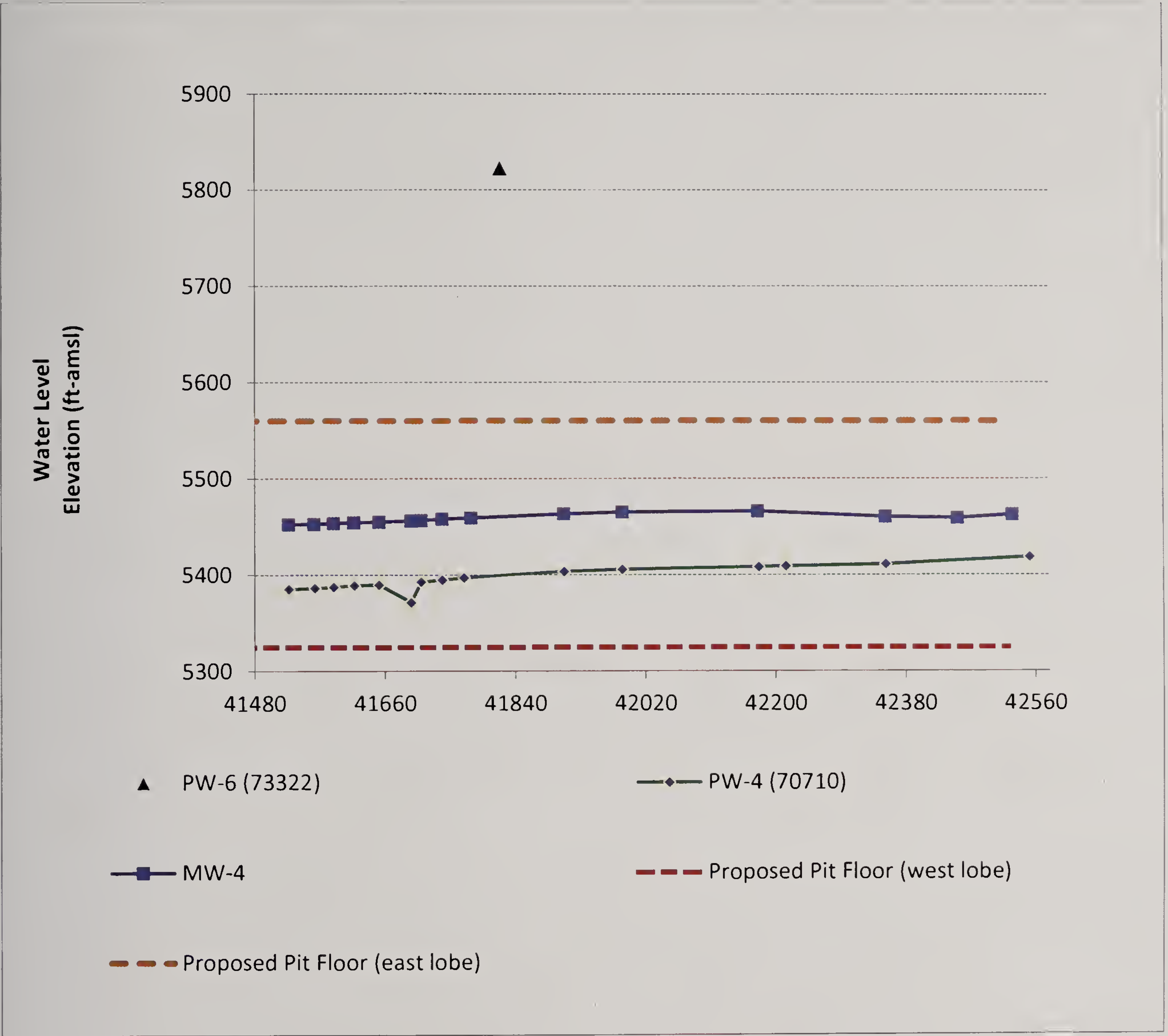
Figure 3.4-10
Groundwater Monitoring Sites in the vicinity of the Proposed King Pit Expansion (Proposed Action/ Reconfiguration Alternatives)

0 200 400 600 800 1,000 Feet
0 100 200 300 Meters
1:10,500

10/12/2017

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data.

Figure 3.4-11. Groundwater Elevations near the Proposed King Pit Expansion (Proposed Action and Reconfiguration Alternatives)



Regionally, the groundwater levels in the bedrock indicate that groundwater generally flows from northeast to southwest (Golder 2014). However, the drop in groundwater elevation between MW-4 and PW-4 indicate that in this location there is a strong northward component to the groundwater gradient between these wells. Comparison of the initial "static" water level recorded for PW-4 at the time the well was constructed in 2012 indicates that current water levels are similar to when the well was constructed. In addition, review of available groundwater elevation data recorded in both the monitoring and production wells on site indicates that the groundwater system is not behaving as a single aquifer system defined by a gradient towards the southwest. Specifically, MW-4, PW-3, PW-4 and NA-2S (and the pre-dewatering water level for NA-2D), and MW-2R recorded water levels that are above the 5,450 feet-amsl elevation; while MW-1 and MW-2 (abandoned in 2015) recorded initial "steady state" water levels that are below 4,820 feet amsl elevation. This large discrepancy (> 630 feet) in water level elevation in wells located within 1,000 feet of each other is not completely understood and not explained by effects associated with mine-induced drawdown from dewatering at BMGI. It is assumed that these variable groundwater elevations likely reflect complex structural controls and locally there is at least two distinct groundwater

flow systems (informally referred to for discussion purposed as the “upper” and “lower” groundwater flow systems) on the project site that do not appear to be hydraulically connected.

Based on the available data, this evaluation conservatively assumes that the higher water levels recorded in the MW-4 and PW-4 wells in the vicinity of the King Pit represent an “upper” groundwater system. Even though it is likely that the gradient for this aquifer is towards the west or southwest across the pit, there are no monitoring wells that encountered groundwater located west of PW-4 to provide the necessary data to allow for projecting the groundwater gradient from this aquifer across the west lobe of the pit. The highest water level elevation recorded in MW-4 and PW-4 are approximately 5,466 feet-amsl and 5,418 feet-amsl, respectively. Under the Proposed Action, mining in the west lobe of the King Pit would extend to an elevation of 5,325. The comparison of the groundwater elevations and pit floor elevations suggest that there is a potential for proposed mining to intercept this “upper” groundwater flow system.

Based on the available data, and recognizing that the water levels in this area of the pit are uncertain, there may be potential for groundwater flow to be encountered in the west lobe of the pit. Depending on the inflow rates, groundwater inflows combined with runoff from the pit wall and direct precipitation there may be potential to result in sufficient flow for development of a pit lake in the west lobe of the King Pit. (Potential monitoring and mitigation measures to address the potential for pit lake development are provided in Section 3.4.4).

QLC Pit

The planned configuration of the ultimate pit surface of the QLC Pit at the end of Proposed Action mining sequence is illustrated on **Figure 3.4-12**. For discussion purposes, the pit floor of the ultimate pit surface can be described as consisting of a west lobe with a floor elevation of 5,285 feet amsl; and an east lobe with a floor elevation of 5,320 feet amsl. Under the Proposed Action, the QLC Pit would not be backfilled.

As described previously for the King Pit, the potential for groundwater to be intersected as the pit is deepened during active mining and for pit lake(s) to develop in the post-mining period was evaluated by reviewing recent and historic water level data collected in monitoring and water supply wells located within or near the footprint of the ultimate pit surface. The locations of existing or historic wells located within 1,200 feet of the proposed pit footprint are shown on **Figure 3.4-12**. These wells include an active project monitoring well (MW-1), an active project water supply well (PW-3), and a regional monitoring well (NA-2A).

MW-1 is the deepest monitoring well on site (1,400 feet) with screen intervals situated between 4,878- and 4,478-feet amsl elevations in material described as chert with fractures that are part of the Paleozoic marine clastic rock sequence. PW-3 is 520 feet deep with screen intervals situated between the 5,361- and 5,171-feet amsl in elevation and described on the drillers log as being completed in brown and gray sandstone with quartz. Based on the regional geologic mapping and the descriptions on the drillers log, it appears that PW-3 is completed in the Elder Sandstone that is also part of the Paleozoic marine clastic sequence. The project baseline hydrogeologic report provides copies of the driller’s logs and lists the completion for PW-3 as “Marine Clastic Rock” (Table 4, Golder 2014). NA-2A is completed to a depth of 400 feet with a screen interval situated at approximately 5,350- to 5,310-feet amsl elevation. NA-2A is described as completed in the Paleozoic marine clastic sequence.

Proposed Project Boundary

Site Production Well (Active)

Site Monitoring Well (Active)

Other Monitoring Well (Active)

Queen Lode Complex Pit

Pit Backfill Area (Reconfiguration Alternative Only)

Ultimate Pit Surface Elevation

100' Contour Interval

20' Contour Interval

Source: Golder 2014, SRK 2014a

Tuscarora Field Office

Elko District Office

Elko

Reno

Las Vegas

Rossi Mine Expansion Project EIS

Figure 3.4-12

Groundwater Monitoring Sites in the vicinity of the Proposed QLC Pit (Proposed Action/ Reconfiguration Alternatives)

0 200 400 600 800 1,000 Feet

0 100 200 300 Meters

1:10,500

N

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notice.

The groundwater elevations recorded from MW-1, PW-3 and NA-2S are compared with the planned pit floor elevations of the west and east lobes of the QLC Pit on the hydrograph provided in **Figure 3.4-13**. The water levels recorded at MW-1 are below the 4,820-foot amsl elevation and are declining over time as a result of regional drawdown from mine dewatering at the BGMI. In contrast, the water level in PW-3 and NA-2A record similar groundwater elevations that are consistently above the 5,450 feet amsl elevation (>630 feet higher than the water level at MW-1). Mine induced drawdown resulting from dewatering activities at BGMI have resulted in a decline of water level elevations at MW-1. Over the September 2013 and July 2015 period, the water levels recorded in MW-1 exhibited a steady decline totaling approximately 21 feet. There are no measurements between July, 2015 and March 2016 when quarterly monitoring resumed. Measurements from March 2016 and June 2016 indicate that the depth to water levels in MW-1 was greater than the 1,000 meter length of the water level tape (i.e., <4,658 feet amsl) (AECOM 2016a, HES 2016c); indicating a total drawdown since monitoring was initiated in September, 2013 of >158 feet.

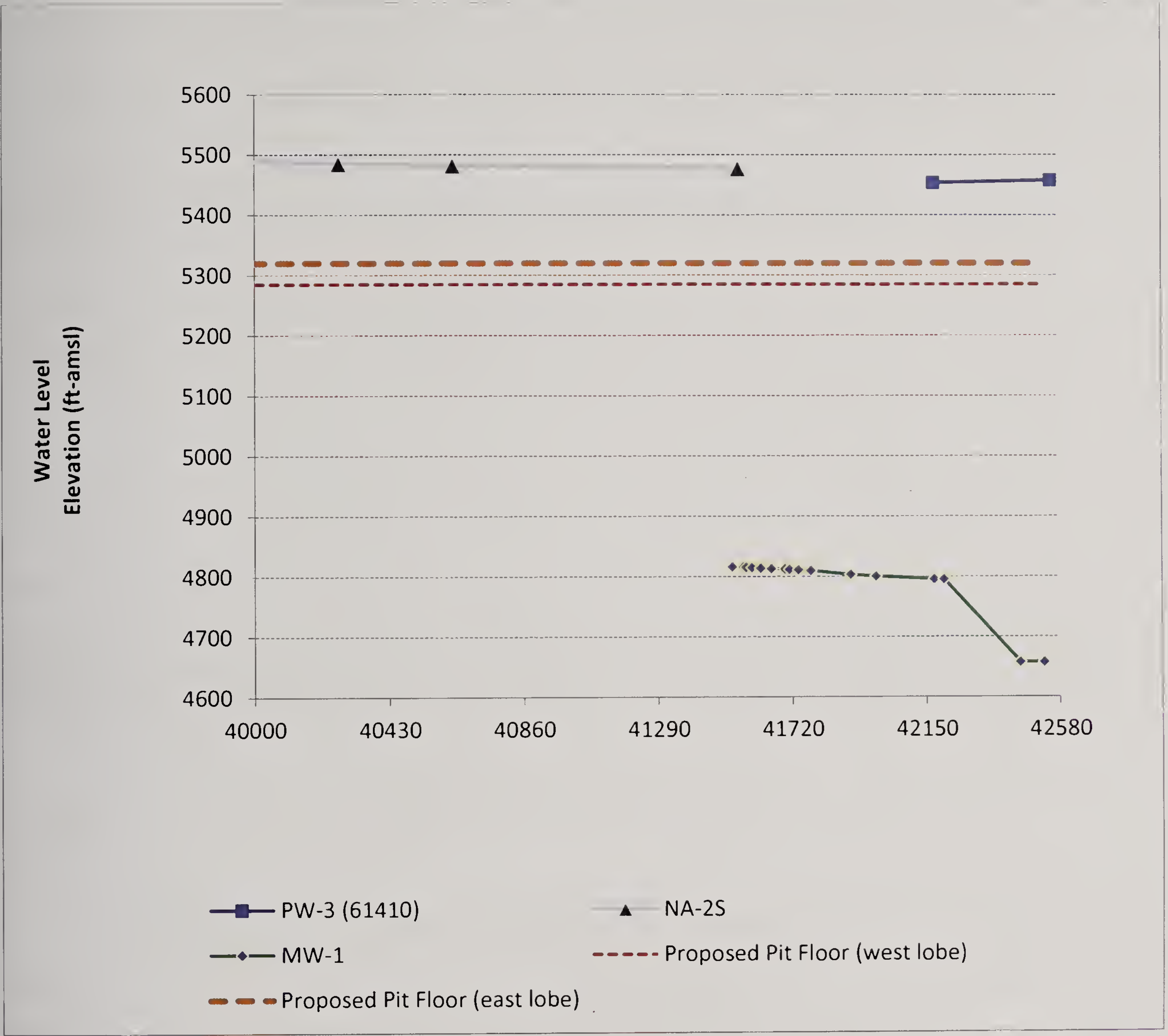
PW-3 was constructed in 1995 and is an active water supply well with a reported initial “static” water level of 5,533 feet amsl. Two additional water levels available for PW-3 from June, 2015, and July, 2016 recorded water levels of approximately 5,454 and 5,458 feet amsl, respectively. Compared to the initial “static” water level recorded in 1995, water levels have declined up to approximately 78 feet since the well was constructed. Likely causes for the 78 feet decline between 1995 and 2016 include: 1) drawdown resulting from continued pumping at the well; 2) regional drawdown associated with mine dewatering activities at BGMI; or 3) a combination of 1 and 2, above. The two recent water level readings from 2015 and 2016 do not indicate that any additional drawdown has occurred over this period.

Prior to mine dewatering effects, the water level at NA-2A was at elevation of approximately 5,498 feet amsl. Between, 1993 and 2013 the water levels at NA-2A has experienced a total drawdown of approximately 21 feet (BGMI 2015).

There is uncertainty regarding the pre-mining and existing groundwater elevations in the proposed QLC Pit footprint area. Review of available groundwater elevation data indicates that the pre-1991 regional groundwater flow is towards the southwest (Golder 2014). However, the water levels observed in MW-1, PW-3 and NA-2S indicate that the groundwater conditions are complex and cannot be explained by a single fractured rock aquifer system with a groundwater gradient towards the southwest. PW-3 and NA-2A record similar groundwater elevations that appear to represent an “upper” groundwater system that is distinct and hydraulically isolated from the “lower” groundwater system monitored in MW-1. PW-3 and NA-2A are inferred to be completed (i.e., screened) in the “upper” system and appear to monitor conditions at the same general elevation zone as would be encountered in the proposed QLC Pit. MW-1, is completed (i.e., screened) in the “lower” groundwater system at depths that are >400 feet below the deepest portion of the pit. For these reasons, this analysis conservatively assumes that the water levels monitored in PW-3 and NA-2A likely reflect the groundwater conditions that may be encountered during mining at the QLC Pit.

Review of the limited groundwater data in the vicinity of the QLC Pit indicates that the “upper” groundwater flow system monitored by wells PW-3 and NA-2A could potentially be encountered or intercepted in the lower portions of the pit in both the east and west lobes of the pit. There are no wells located southwest of PW-3 that would allow for projection of water levels in this “upper” zone across the footprint of the proposed open pit footprint. Depending on the actual water levels in the pit footprint area, and hydraulic properties of the aquifer, there may be potential for this “upper” groundwater system to result in groundwater flow into the lower portions of the pit during mining, and/or in the post-closure period. Depending on the groundwater inflow rates, groundwater inflows combined with runoff from the pit wall and direct precipitation may potentially provide sufficient flow to result in the development of a pit lake in the QLC Pit. (Monitoring and mitigation measures to address the potential for pit lake development are provided in Section 3.4.4).

Figure 3.4-13. Groundwater Elevations near the Proposed QLC Pit (Proposed Action and Reconfiguration Alternatives)



Water Quality Impacts

Potential water quality impacts evaluated below include pit water quality, run off or infiltration from the proposed WRDFs, ore stockpiles, and jig waste stockpiles; and stormwater runoff from project facilities.

Pit Water Quality

As with the current operation, water that accumulates in the pits during mining that does not evaporate would be collected in sumps and used for dust suppression (SRK 2014c). Depending on the groundwater elevations and hydraulic properties of the groundwater system intercepted by the King Pit and QLC Pit (particularly the resultant groundwater flow rates) there may be a potential for groundwater flow combined with runoff and direct precipitation to result in the development of pit lakes during the post-closure period. If pit lakes develop, the water quality of the pit lakes during the early stages of pit lake development would largely depend on the pit wall runoff water quality, and groundwater inflow water quality.

The results of the MWMP tests of waste rock material (**Table 3.4-10**) provides an indication of the water quality of the pit wall runoff, and pore water quality resulting from the initial saturation of backfill material placed in the pit. The average concentrations from the MWMP tests for the King waste rocks and Queen waste rocks indicate that pH was near neutral (6.5 s.u.) with low metal concentrations. The MWMP test results indicate that these rock materials had average solute concentrations that were below the Nevada drinking water standard with the exception of aluminum in the King waste rock (0.5 mg/L) that exceeds the secondary standard of 0.2 mg/L; and mercury in the Queen waste rock (0.0051) that exceeded the primary standard of 0.002 mg/L.

The water quality of the groundwater that could potentially flow into the pits was evaluated by reviewing the results of water quality monitoring at wells located near the pits that are completed in the same groundwater flow system that could be intercepted in the lower portions of the proposed King Pit expansion and proposed QLC Pit. Specifically, MW-4 and PW-4 located near the proposed King Pit expansion, and PW-3 located near the proposed QLC Pit, are completed in the Paleozoic marine clastic rocks. As summarized in **Table 3.4-7**, groundwater quality monitoring results for these wells indicate that the groundwater quality is generally good with neutral to alkaline pH with low metals concentrations and low TDS concentrations (200-370 mg/L). The water quality from these wells has not exceeded the primary drinking water standards; however, the maximum concentrations in one or more of these wells exceeded the secondary drinking water standards for iron and manganese (MW-4, PW-4 and PW-3) and pH (PW-4 only).

Under the Nevada Administrative Code, post-mining pit lake water quality must not have the potential to degrade groundwaters of the state or adversely affect the health of human, terrestrial, or avian life (NAC 445A.429). The hydrogeologic setting and climate and results from other pit lake studies in the adjacent Arturo Project and Betze Pit Expansion Project (BLM 2014a, BLM 2008a) strongly suggest that any pit lake that develops in the King Pit or QLC Pit that is sustained by groundwater inflow would behave as a sink. Therefore, pit lake water quality is not expected to discharge to, or affect the water quality in downgradient aquifers.

The baseline rock geochemical testing data and groundwater monitoring results suggest that the pit lake water quality (if pit lakes develop) would likely be near neutral pH with low metals concentrations. The entire pit shells for both the King pit expansion and QLC Pit are planned to be in oxidized rock, therefore, acid mine drainage is unlikely. Studies of potential pit lakes in other mines along the Carlin Trend including mines with open pits that expose unoxidized rock with sulfide minerals indicate that these future pit lakes are also not predicted to be acidic or have high metals concentrations (Shevenell et al, 1999, BLM 2014a, BLM 2008a).

The predicted pit lakes at the Arturo Mine located immediately south of the Project, are predicted to turn over seasonally and remain oxidized throughout the water column (BLM 2014a). Considering the similarities in setting, it appears likely that any pit lake developed under the Proposed Action would behave in a similar fashion.

In summary, although the water quality of potential pit lakes that may develop under the Proposed Action cannot be currently predicted using available information, review of available data suggest that the potential for development of pit lakes with low pH, or high metals concentrations appears to be low (Potential monitoring and mitigation measures to address the potential for pit lake development are provided in Section 3.4.4). Potential risk to wildlife associated with exposure to the pit lakes is discussed Section 3.17, Wildlife and Aquatic Biological Resources.

Waste Rock Disposal Facilities

The proposed project would generate approximately 143.5 million tons of additional waste rock material that would be placed in the King North, QLC East, QLC North, and Dawn WRDFs as described in Section 2.3.6, Waste Rock Disposal Facilities. The estimated percentages of waste rock by rock type that would be generated during the proposed mine expansion is provided in **Table 3.4-15**. The estimated percentages of materials assumes that waste rock generated from the Dawn Pit would be approximately the same as defined for the QLC Pit because of similar lithology at both locations (SRK 2014e).

An estimated 95 percent of the waste rock from the King Pit, and 80 percent of the waste rock from the QLC and Dawn Pits consist of chert bedrock material that has undergone extensive oxidation. The remaining 5 percent of the waste rock material from the King Pit would consist of alluvium; and remaining

20 percent of the material from the QLC and Dawn Pits would be comprised of intrusive rock, tuff, and alluvium (all categorized as oxide materials with no visible sulfide minerals). Fault gouge material would make-up <1 percent of waste rock generated from each pit.

Unoxidized chert is the only material in the mine pit areas that contains visible sulfide minerals (i.e., pyrite) ranging from a trace to less than 1 percent. The Proposed Action pit design is intended to purposely avoid mining of unoxidized material (HES 2016f). The oxidation boundary is readily discernable in drill cores and in excavations due to the abrupt color change between the oxidized chert (brown to red coloration) and unoxidized chert (black). Under the Proposed Action, HES would monitor the excavations during mining for this distinct color change. If unoxidized material is encountered, mining activities would be terminated in those areas (HES 2016f). Therefore, the proposed mining is unlikely to encounter or generate any unoxidized chert material as waste rock. Consequently, the volume of unoxidized chert in the waste rock facilities is expected to be negligible.

The NDEP recently reviewed all the available rock geochemistry data for the project and issued a WPCP for the project that includes both the existing mine and proposed mine expansion (NDEP 2016c). The NDEP fact sheet (NDEP 2016a) issued as part of the permitting process included the following statement:

> *"Based on the characterization program results, material that will be mined from the Rossi operations will consist entirely of non-potentially acid generating (non PAG) material. The Permittee is required to sample and characterize the ore, waste rock, and jig reject product, pursuant to the Permit; and in the unlikely event PAG material is encountered, the material will be segregated and encapsulated within the WRDFs"* (NDEP 2016a).

Table 3.4-15. Predicted Waste Rock Geochemistry

Material Type	Rock Type	Oxidation	Estimated Percentage of Waste Rock			Acid Generation Classification[1]
			King Pit	*QLC Pit*	*Dawn Pit*	
Overburden/ Waste Rock	Alluvium	Oxide	5	5	5	Non-PAG
	Chert	Oxide	95	80	80	Non-PAG
		Non-Oxide[2]	<1	<1	<1	PAG
	Tuff	Oxide	<1	5	5	Non-PAG
	Intrusive	Oxide	<1	10	10	Non-PAG
	Fault Gouge	Oxide	<1	<1	<1	Non-PAG
Totals			**100**	**100**	**100**	

Source: SRK 2014e.

[1] Acid Generation Classification based on HCT results.
[2] Occurs below the depths of the proposed pits, and would not be mined under the Proposed Action.

The geochemical testing data for waste rock material is provided in the Geochemical Characterization Report for the Rossi Mine (SRK 2014e) and summarized in Section 3.4.1.5, Rock Geochemistry. Representative samples of waste rock, ore and jig byproducts were collected as part of the geochemical characterization program. The characterization samples included material collected from exposed pit walls, WRDFs, ore stockpiles, jig waste areas and core samples from exploration drill holes located within the proposed QLC Pit.

As summarized in **Table 3.4-15**, the results of the geochemical characterization of the waste rock materials indicated that essentially all of the waste rock materials to be generated from the open pit mining included in the Proposed Action are classified as non-PAG material. The prediction of acid generation and metals leaching was based on the chemical analyses of leachate from HCT of representative waste rock materials. The results of the HCT test indicated that only one rock type (i.e., unoxidized chert with visible pyrite)

generated acid leachate. However, as indicated previously, the unoxidized chert occurs below the depth of the proposed open pit mining and therefore, would not be mined.

The metals leaching risk of waste rock is closely related to the solution pH. The sample that generated acidic conditions (pH <5.5 s.u.) in MWMP tests or humidity cell tests tend to have moderate to high levels of base metals while near-neutral pH samples had mostly low base metal levels. The HCT results for samples of oxidized chert indicate that the leachate generated over the test period had concentrations of trace metals that were below the NDEP reference values with the exception of exceedances of aluminum, arsenic and iron in one or more of the cells. Metal mobilization during the MWMP tests were generally minimal, with base metal concentrations being low or below detection with the exception aluminum and mercury that were elevated above the NDEP reference values in one or more samples (see Section 3.4.1.5, Rock Geochemistry). In materials containing oxidized iron, an important mechanism that reduces the mobility of trace metals is sorption on iron oxyhydroxides. As a result, localized rock materials within the WRDFs that may generate elevated levels of soluble metals would tend to be sorbed by adjacent rock masses as interstitial water from these zones migrates (BLM 2012a).

Construction, operation and management, and closure and reclamation of the facilities would include BMPs for stormwater management and erosion control. Typical BMPs for stormwater management and erosion control that may be applied include such measures as construction of structural controls (berms or diversions ditches, and localized regrading to control runoff or runon, installation of rip rap), or other erosion stabilization methods (NDEP 2008a). After mining cessation, the WRDFs would be covered with growth media and would have rounded crests and variable slope angles to resemble natural landforms, to the extent possible. After reclaimed vegetation becomes established and drainage systems stabilize, any surface runoff (expected to be an infrequent occurrence based on climatic conditions) would minimize sediment movement. Based on the geochemical characterization results, stormwater management controls, and planned reclamation, runoff from the WRDFs is not expected to impact surface water quality in Antelope Creek or Boulder Creek.

Infiltration rates for similar reclaimed waste rock facilities in the mining district are estimated to be low [i.e., approximately 2 percent of precipitation (BLM 2012a)]. Water levels data indicate that the depth to the regional groundwater aquifer is likely to be several hundred feet below the footprint of the proposed WRDFs. Even after mine dewatering operations at the Barrick Goldstrike Mine cease and water levels rebound in the southern portion of the proposed project area, the depth to groundwater would still be several hundred feet beneath the WRDFs footprints. The fact that the waste rock material would be non-acid generating, and have low potential for metals release, combined with the depth to groundwater, and low seepage rates indicate that seepage from the WRDFs is not expected to result in a measurable change in downgradient groundwater quality that would exceed water quality standards for the anticipated beneficial uses (such as a potential source of drinking water).

Pit Backfill

As described in Section 2.3.5.3, the Dawn Pit would be backfilled with waste rock produced from the QLC Pit. Prior to closure, the backfilled Dawn Pit would be re-contoured to match surrounding topography and reclaimed according to BLM and NDEP-BMRR standards. Comparison of the proposed floor elevation of the Dawn Pit (5,800 feet-amsl) with available information on pre-dewatering groundwater elevations in the area (approximately 5,500 feet-amsl at NA-2S) indicates that the pit floor is situated approximately 300 feet above the pre-dewatering water table; therefore, the backfill material would not be impacted by groundwater flow. Therefore, water quality impacts associated with the pit backfill would be the same as described previously for the WRDFs.

Ore Stockpiles and Jig Waste Materials Stockpile

As described in Section 2.3.7.1, barite ore stockpiling, jig waste material stockpile and disposal would continue similar to existing authorizations and in accordance with the NDEP WPCP. The results of the HCT test indicate that two representative samples each of barite ore and jig byproduct (waste and tailings) produced circum-neutral to mildly alkaline leachate through the test duration and exhibit low associated metal release (SRK 2014e). The MWMT results also indicate that the jig tails also leached average concentrations of arsenic (0.012 mg/L) and manganese (0.12 mg/L) that slightly exceeded their respective NDEP reference values (0.01 mg/L arsenic [primary MCL]; 0.1 mg/L manganese [secondary

MCL]). In summary, the ore and jig waste material is non-acid generating and has a low potential to release elevated concentrations of trace metals. Therefore, ore stockpiling and jig waste stockpiling activities are not expected to result in impacts to surface or groundwater resources.

Stormwater Management

Stormwater runoff from proposed facilities and disturbed areas would be captured in down-gradient diversion channels and routed into a series of sediment ponds as described in the stormwater control design report (SRK 2014c). Stormwater would be managed under the proposed project in accordance with the Nevada General Stormwater Permit and the Rossi Mine SWPPP (AECOM 2012c). BMPs would be applied to route or control runoff and would reduce potential impacts from accelerated erosion and sedimentation as specified in the SWPPP. Standard BMPs typically used for stormwater management include diversion berms and dikes, diversion ditches and swales, installing silt fences and other sediment barriers, protecting slopes to prevent gully formation, sediment traps and basins, and regular inspections and other methods described in the Nevada Contractors Field Guide for Construction Site Best Management Practices (NDEP 2008a). Mining facilities would be monitored (including quarterly inspection, and following spring snowmelt and intense rain events) as specified in the SWPPP to demonstrate that drainage and sediment control measures are effective and operating properly. If inspections indicate controls are observed to not be functioning properly, controls would be modified in accordance with the SWPPP.

Although potential impacts would be avoided or reduced under anticipated construction and operating conditions by compliance with agency programs and proposed measures, extreme weather events may create bypass conditions or unforeseen impacts. Severe (high intensity) storms, rapid snowmelt, or rain-on-snow events have the potential to damage operating or reclaimed project components. This has been known to occur at other mining sites in the region (BLM 2008a). Resulting adverse effects may include degradation of waters of the state and delays in successful restoration of post-mining land uses.

3.4.2.2 Reconfiguration Alternative

The volume of ore mined, waste rock generated, and ultimate pit configurations associated with expansion of the King Pit, and QLC, and new mining at the Dawn Pit would be the same as the Proposed Action. The Reconfiguration Alternative would modify the configuration of several WRDFs (Dawn, QLC North, QLC East, and King North WRDFs) and include backfill of the east portion of the QLC Pit as shown on **Figure 2-7**, and described in Section 2.4.2, Reconfiguration Alternative. All applicable design features and Applicant Committed Environmental Protection Measures (**Table 2-16**) described for the Proposed Action would be required for the Reconfiguration Alternative. Potential impacts to water resources would generally be the same as described for the Proposed Action, except as described below. Potential impacts to water resources resulting from exploration throughout the project area would generally be the same as described for the Proposed Action.

Impacts to Streams, Springs, Impoundments, and Seeps

As described in Section 3.4.1.2, Surface Water Resources, there are two perennial springs (SP-001, SP-002) identified within the proposed PoO boundary. Potential impacts to SP-001 and its associated perennial reach would be the same as described for the Proposed Action. The reconfiguration of the QLC WRDF under the Reconfiguration Alternative would result in an increase in the length of the stream reach (associated with Spring SP-002) covered by waste rock by approximately 85 feet (for a total length of 1,124 feet of buried stream). A trenched subdrain system would be constructed to convey flow from the SP-001 and SP-002 spring source areas prior to expansion of the existing WRDFs footprints into these areas as described under the Proposed Action (HES 2016e).

Short reaches of unnamed ephemeral stream channels would be removed or covered by proposed project components. These mostly occur in the footprint areas of the QLC North WRDF, QLC East, Dawn WRDF, and QLC Pit.

Watershed Impacts

Stormwater runoff from proposed facilities and disturbed areas would be captured in down-gradient diversion channels and routed into a series of sediment ponds as described in the stormwater control

design report (SRK 2014c). The open pits are closed basins such that precipitation runoff within the boundaries of the open pits would be captured within the pits. Flow captured in the sediment ponds or in open pit areas would not contribute to flow in Antelope Creek or Boulder Creek.

The nearest downstream monitoring station on Antelope Creek that captures all of the drainage area within the proposed PoO boundary is Station ANT-2 (**Figure 3.4-3**) located approximately 6 miles downstream (southwest). The watershed area located above Station ANT-2 is approximately 71,950 acres (112.4 square miles). Disturbance under the Reconfiguration Alternative would remove approximately 1,075 acres of the contributing watershed to Antelope Creek. The acreage of removal of contributing watershed is the same as estimated for the Proposed Action. The removal of contributing watershed area represents approximately 1.5 percent of the Antelope Creek drainage located above Station ANT-2.

The nearest downstream monitoring station on Boulder Creek is Station BC-AA (**Figure 3.4-3**), located about 1.3 miles downstream from the proposed PoO boundary. Station BC-AA receives flow from the Boulder Creek headwaters. The watershed area above BC-AA is approximately 17,540 acres (27.4 square miles). The basin areas for the proposed project would affect the contributing watershed area of upper Boulder Creek. Under the Reconfiguration Alternative, approximately 272 acres of contributing watershed area would be removed from the upper Boulder Creek drainage in the post-mining topographic configuration. This acreage of removal of contributing watershed is less than the 393 acres estimated for the Proposed Action. The expansion of the watershed area affected by the proposed WRDF would represent approximately 1.6 percent of the Boulder Creek drainage located above Station BC-AA.

The watershed areas affected by the drainage modifications resulting from the Reconfiguration Alternative are drained by ephemeral streams. The overall impacts of these drainage modifications on flow quantities monitored at Antelope Creek (at ANT-2) and Boulder Creek (at BC-AA) would probably not be measurable.

Potential impacts to floodplains and flood hydrology from the Reconfiguration Alternative would be minimal and similar to the Proposed Action. No federally delineated flood hazard zones have been identified within the proposed project area, and drainage-ways consist of narrow ephemeral streams.

Potential for Pit Lake Development

As summarized in **Table 3.4-14**, the potential for pit lake development would be the same as described for the Proposed Action (i.e., pit lakes may potentially develop in the King Pit and QLC Pit) with the exception that the proposed backfill in the east lobe of the QLC Pit would preclude pit lake development in the east lobe of the QLC Pit. However, as with the Proposed Action, there may be a potential for a pit lake to develop in the west lobe of the QLC pit that would not be backfilled. For additional discussion regarding the potential for pit lakes to develop in the post-closure period see discussion under the *Potential for Pit Lake Development* heading provided in Section 3.4.2.1.

Water Quality Impacts

Pit Water Quality

The complete backfill of the east lobe of the QLC Pit that would occur under the Reconfiguration Alternative would restrict any potential pit lake development to the west lobe of the pit. After closure, the recovered groundwater elevations would likely saturate a portion of the backfill material. Groundwater flow through the backfilled east lobe would likely discharge into the pit lake that may potentially develop in the west lobe of the QLC pit. The results of the MWMP tests of waste rock materials (**Table 3.4-10**) provide an indication of the water quality of the pore water quality resulting from the initial saturation of backfill material placed in the pit. The average concentrations from the MWMP tests for the Queen waste rock indicate that pH was near neutral (6.5 s.u.) with low metal concentrations. The MWMP test results indicate that these rock materials had average solute concentrations that were below the Nevada drinking water standard with the exception of mercury (0.0051) which exceeded the primary drinking water standard of 0.002 mg/L. The potential impacts associated pit water quality would be similar to those described for the Proposed Action (Section 3.4.2.1).

Waste Rock Disposal Facilities

The pit configuration and amount of ore extracted and waste rock generated under the Reconfiguration Alternative would be the same as for the Proposed Action. As with the Proposed Action, the Reconfiguration Alternative would generate approximately 143.5 MT of additional waste rock material that would be placed in the King North WRDF expansion, and the reconfigured QLC East, QLC North, and Dawn WRDFs. These facilities would be designed, reclaimed and closed as described under the Proposed Action. The estimated percentages of waste rock by rock type, and geochemical characterization of the waste rock material that would be generated under the Reconfiguration Alternative would be the same as listed in **Table 3.4-15**, and summarized for the Proposed Action (Section 3.4.2.1). Therefore, potential impacts associated with surface water runoff and infiltration to groundwater would be the same as described for the Proposed Action.

Pit Backfill

Under the Reconfiguration Alternative, both the Dawn Pit and the eastern portion of the QLC Pit would be completely backfilled with waste rock generated from the QLC Pit and recontoured to match with the adjacent natural topography. The potential impacts associated with backfilling the Dawn Pit would be the same as described under the Proposed Action. Comparison of the proposed floor elevation of the Dawn Pit (5,800 feet-amsl) with available information on pre-dewatering groundwater elevations in the area (approximately 5,500 feet-amsl at NA-2S) indicates that the pit floor is situated approximately 300 feet above the pre-dewatering water table; therefore, the backfill material would not be impacted by groundwater flow. Therefore, water quality impacts associated with the pit backfill would be the same as described previously for the WRDFs.

Comparison of the ultimate pit floor elevations in the eastern portion of the QLC Pit (5,320 feet-amsl) with available groundwater elevation data from wells located in the vicinity of the pit indicates there is a potential for water table to eventually rebound intersect the backfill materials. Potential water quality impacts associated with the potential groundwater flow through the backfill material are discussed under the *Pit Water Quality* heading (provided above).

Ore Stockpiles and Jig Waste Materials Stockpile

As described in Section 2.3.7.1, barite ore stockpiling, jig waste material stockpile and disposal would continue similar to existing authorizations and in accordance with the NDEP WPCP. The geochemical characterization of the ore and jig waste material is described under the Proposed Action. In summary, the ore and jig waste material is non-acid generating and has a low potential to release elevated concentrations of trace metals. Therefore, ore stockpiling and jig waste stockpiling activities are not expected to result in impacts to surface or groundwater resources.

Stormwater Management

As discussed under the Proposed Action, stormwater runoff from proposed facilities and disturbed areas included in the Reconfiguration Alternative would be captured in down-gradient diversion channels and routed into a series of sediment ponds as described in the Stormwater Control Design Report (SRK 2014c). The general design approach for stormwater management, and specification provided in the SWPPP (AECOM 2012c) are assumed to be the same as described for the Proposed Action. Therefore, potential impacts to water quality associated with stormwater control would be similar to those discussed for the Proposed Action.

3.4.2.3 Livestock Fencing Alternative

Under the Livestock Fencing Alternative, a livestock exclusion fence would be installed around the perimeter of the PoO boundary as shown in **Figure 2-15**. The fence would be removed once the mine is reclaimed and revegetation is determined successful by the BLM and NDEP. All other aspects of the Proposed Action and Reconfiguration would remain the same if the Livestock Fencing Alternative is implemented with the project approval. Therefore, impacts to water resources would be the same as previously described under the Proposed Action (Section 3.4.2.1) and Reconfiguration Alternative (Section 3.4.2.2).

3.4.2.4 No Action Alternative

Under the No Action Alternative, the proposed project would not be developed and the related potential impacts to water resources would not occur. The No Action Alternative consists of continuation of mining and processing operations and closure and reclamation activities at the existing Rossi Mine under the terms of current permits and approvals as authorized by the BLM and the State of Nevada listed in **Table 2-1**. No additional ground-disturbing activities beyond those currently authorized would occur at the mine site. Effects to water resources associated with continued operations under the No Action Alternative would be the same as summarized in the EA for the existing operations (BLM 2010a). For comparative purposes, the groundwater pumping requirements, and potential impacts to streams and springs and watershed resulting from the No Action alternative are summarized below.

Water Quantity Impacts

The No Action Alternative would include continuation of groundwater pumping on site to supply the project at the existing pumping rates. In 2015, the existing mine operation pumped water from three wells (PW-1, PW-3 and PW-5 in **Table 3.4-4** and **Figure 3.4-5**) at a combined rate of 43 gpm (HES 2015c). Additional water required for the project would continue to be provided by trucking water from the Barrick Goldstrike Mine dewatering operations. The water requirements would continue to supply water at the current rates until 2018.

Impacts to Streams, Springs, Impoundments, and Seeps

As described in Section 3.4.1.2, Surface Water Resources, there are two perennial springs (SP-001, SP-002) identified within the proposed PoO boundary. Both springs emerge from the toe of existing WRDFs and support local perennial reaches in unnamed drainage areas downstream from the spring source. For the purpose of water resources impact analysis, the length of perennial stream supported by the spring discharge from SP-001 and SP-002 was assumed to be approximated by the length of the riparian herbaceous area mapped by EcoSynthesis (2013) as shown on **Figure 3.4-4**.

Expansion of the King North WRDF under the currently authorized activities included under the No Action alternative, would cover the SP-001 spring source and approximately 1,230 feet of the stream reach apparently supported by spring discharge with waste rock. Expansion of the King South WRDF under the currently authorized activities, would cover the SP-002 spring source and approximately 967 feet of the stream reach that is apparently supported by spring discharge with waste rock.

Watershed Impacts

Stormwater runoff from proposed facilities and disturbed areas would be captured in down-gradient diversion channels and routed into a series of sediment ponds as described in the Stormwater Control Design Report (SRK 2014c). The open pits are closed basins such that precipitation runoff within the boundaries of the open pits would be captured within the pits. Flow captured in the sediment ponds or in open pit areas would not contribute to flow in Antelope Creek or Boulder Creek.

The western portion of the existing project PoO area drains to Antelope Creek. The watershed area located above Station ANT-2 (located approximately 6 miles downstream from the project) is approximately 71,950 acres (112.4 square miles). Disturbance under the No Action Alternative would remove an estimated 380 acres of the contributing watershed to Antelope Creek. The removal of contributing watershed area under the No Action represent approximately 0.5 percent of the Antelope Creek drainage located above Station ANT-2.

The nearest downstream monitoring station on Boulder Creek is Station BC-AA (**Figure 3.4-3**), located about 1.3 miles downstream from the existing PoO boundary. Station BC-AA receives flow from the Boulder Creek headwaters. The watershed area above BC-AA is approximately 17,540 acres (27.4 square miles). The basin areas for the proposed project would affect the contributing watershed area of upper Boulder Creek. Under the No Action Alternative, approximately 161 acres of contributing watershed area would be removed from the upper Boulder Creek drainage in the post-mining topographic

configuration. The expansion of the watershed area affected by the authorized WRDFs would represent approximately 0.9 percent of the Boulder Creek drainage located above Station BC-AA.

Potential for Pit Lake Development

As summarized in **Table 3.4-14**, review of available groundwater information indicates that the potential for pit lakes to develop in the post-closure period is low under the existing authorized mining included in the No Action Alternative. For additional discussion regarding the potential for pit lakes to develop in the post-closure period see discussion under the *Potential for Pit Lake Development* heading provided in Section 3.4.2.1.

Water Quality Impacts

Pit lakes are not anticipated to develop under the No Action alternative. Potential impacts to water quality associated with the disposal of waste rock materials on site would generally be the same as discussed for the Proposed Action (Section 3.4.2.1).

3.4.3 Cumulative Impacts

The CESA for water resources is defined in Section 3.4.1, Affected Environment, and includes Rock Creek, Boulder Flat and Maggie Creek HAs (1,420 square miles) as shown in **Figure 3.4-1**. RFFAs for mining and exploration activities are identified in **Table 3.2-1**; their locations are shown in **Figure 3.2-1** and **Figure 3.2-2**. RFFAs for large scale non-mining development activities are identified in Section 3.2.1.5, Grazing and Agriculture; Section 3.2.1.6, Oil, Gas and Geothermal Leasing; Section 3.2.1.7, Utilities; Section 3.2.1.8, Wildfires; and Section 3.2.1.9, Wildfire Re-seeding. **Figure 3.2-2** also illustrates some ROW actions.

3.4.3.1 Climate Change Effects to Water Resources

The following discussion of climate change pertains to the cumulative effects to water resources under all alternatives. The potential effects to water resources associated with climate change are the same as summarized in the Clark, Lincoln, and White Pine Counties Groundwater Development Project Final EIS prepared by the BLM Nevada State Office (BLM 2012c):

Global climate change models predict potential alterations in the distribution and seasonality of precipitation (Houghton et al. 1996; Mahlman 1997; Giorgi et al. 1998). The effects of this climate change already are being observed in the western U.S., including the reduction and earlier melting of mountain snowpacks, earlier timing of spring runoff, and associated declines in river flows (Garfin et al. 2013, Barnett et al. 2008; Dettinger et al. 2004; Stewart et al. 2004). Climate change simulations also clearly indicate a general, large-scale warming over the western U.S. (Barnett et al. 2004), which likely would lead to more widespread drought. Paradoxically, a warmer atmosphere and an intensified water cycle are likely to mean not only a greater likelihood of drought for the Southwest, but also an increased risk of flooding (USGCRP 2009). Patterns of precipitation currently are changing, with more rain falling in heavy downpours that also can lead to such flooding events (Allan and Soden 2008; IPCC 2007a). Moreover, increased flood risk in the Southwest is likely to result from a combination of decreased snow cover on the lower slopes of high mountains and an increased fraction of winter precipitation falling as rain and therefore running off more rapidly (Knowles et al. 2006). This increase in rain-on-snow events also could result in rapid runoff and flooding (Bales et al. 2006). Winter precipitation in Arizona is becoming increasingly variable, with a trend toward both extremely dry and extremely wet winters (Goodrich and Ellis 2008). Greater variability in patterns of precipitation can be anticipated in the future. Rapid landscape transformation due to vegetation die-off and wildfire as well as loss of wetlands along rivers also is likely to reduce flood-buffering capacity.

The effect of climate change on streamflow and groundwater recharge would vary regionally and locally, likely following projected changes in precipitation. The impact of climate change on water resources depends not only on changes in the volume, timing, and quality of streamflow and recharge but also on system characteristics, changing pressures on the system, how the management of the system evolves, and what adaptations to climate change are implemented (Arnell et al. 2001). Recent studies from the Sierra Nevada of California indicate that climate change would lead to increasing

winter streamflow and decreasing late spring and summer flow (Miller et al. 2003; Maurer 2007). The amount and timing of runoff are dependent on the characteristics of each basin, especially elevation. Increased temperatures lead to a higher freezing line, and therefore, less snow accumulation and increased melting below the freezing height (Miller et al. 2003). These studies suggest that a decrease in late winter snow accumulation is a confident projection, as is the earlier arrival of the annual flow volume.

Climate change could affect water resources in the project area by impacting:

- Surface hydrology (volume and timing of surface flows, rainfall-runoff response, flood events, water quality, sediment and contaminant transport);
- Vadose zone hydrology (runoff, evapotranspiration, infiltration, groundwater recharge); and
- Hydrogeology (groundwater flow).

3.4.3.2 Proposed Action

Surface Water Resources

Cumulative effects on surface water resources result from 1) mine dewatering and discharge, 2) runoff or seepage from mine components, 3) removal of surface water features within project footprints, 4) road and pipeline construction and maintenance, and 5) wildfire and livestock grazing.

Surface Water Quantity and Quality Effects from Mining

Mining projects within the CESA include those depicted north of the Humboldt River in **Figure 3.2-2**. Approximately 40,286 acres of past and present and projected surface disturbance for mining and exploration actions are located in the water resources CESA, of which 395 acres are attributed to sand and gravel mining operations. This represents approximately 4.3 percent of the 1,420 square mile CESA. Approval of the Proposed Action would add approximately 1,167 acres of new mining related disturbance within the CESA for a total of 41,453 acres, a 2.9 percent increase over the total past, present, and RFFAs within the CESA.

Major streams in the CESA include the Humboldt River; Rock Creek and its tributary Antelope Creek, and Boulder Creek; and Maggie Creek (**Figure 3.4-3**). Perennial or discontinuously flowing stream reaches along these streams would not be adversely affected by direct or cumulative impacts from the Proposed Action.

Runoff from small ephemeral tributaries would be reduced in the upper Boulder Creek drainage and elsewhere, due to expanding mine disturbance in the CESA. The Proposed Action would reduce contributing watershed acreage in the Boulder Creek drainage by approximately 393 acres. This reduction would represent approximately 0.1 percent of the 560 square miles of watershed in Boulder Flat HA. In the Antelope Creek drainage, reduced runoff from the Proposed Action would affect approximately 1,075 acres which represents about 0.4 percent of the Rock Creek Valley HA.

The major effect of these reduced contributing areas would include a slight or negligible reduction of ephemeral flows from snowmelt and rainfall runoff in the CESA. These flows mostly occur in spring. Smaller flow rates and/or shorter flow durations may allow sediment build-up in affected tributary channels, and would reduce shallow groundwater availability in nearby alluvial deposits. Reduced recharge and soil moisture may adversely affect riparian systems. In parts of some streams such as Boulder Creek, lower Maggie Creek, and Antelope Creek, flow reductions could occur from mine-induced groundwater drawdown (BLM 2000c). Within the CESA, reduced ephemeral surface flow contributions would add to these impacts.

The Proposed Action is predicted to not affect any perennial springs or seeps, and therefore, would not contribute to the cumulative impacts to seeps and springs in the CESA.

Cumulative surface water quality impacts could result from runoff and seepage from mining and exploration project components within the CESA. In general, these potential sources include leach pads, tailing ponds, mills and other process buildings, shops and warehouses, process fluid ditches and ponds,

ore stockpiles, waste rock disposal facilities, drill pads and pits, and roads. The severity and extent of these impacts would be reduced or mitigated by project design and construction, and by compliance with regulatory programs and associated permit stipulations. Examples of such controls include ditches, pipelines and containment features to manage runoff and process fluids; stormwater pollution prevention programs; and spill prevention and response programs. In general, cumulative long-term mining impacts to surface water quality would be reduced by waste rock management, compliance with closure and reclamation permits and related agreements, and by the implementation of monitoring and mitigation measures.

Surface water quality impacts could result in the CESA from incidental spills, from intensive storms overwhelming control features and creating bypasses, and by erosion and sedimentation events at mining sites (e.g., ditch or slope failures). These isolated occurrences would affect surface water quality in their immediate locales. Operator and agency responses, in the form of containment and mitigation, would limit the extent and severity of these incidental impacts.

Pit lakes that ultimately form at Gold Quarry, Betze/Post, Arturo, and other sites in the CESA are not anticipated to discharge to surface waters. They are expected to be “sinks,” where water is lost to evaporation (BLM 2008a). Based on modeling at the Betze-Post Pit, predicted concentrations of TDS, sulfate, fluoride, arsenic, cadmium, nickel, and antimony are anticipated to exceed Nevada drinking water standards (BLM 2008a). The pH of Betze-Post pit lake water is anticipated to be near neutral in the long term, but there is a potential that it may be acidic in the short term (BLM 2008a). Pit lakes are not expected to develop under the Proposed Action at the Rossi Mine since the floor of the pits would be situated above the existing, and projected rebounded water table. Therefore, the Proposed Action would not contribute to cumulative impacts in the CESA associated with pit lakes and pit lake water quality.

Effects from Other Watershed Conditions

Other sources of surface water impacts in the CESA include existing conditions from grazing, irrigated croplands, wildland fires, and road construction and maintenance. These also contribute to existing surface water conditions of surface water flow and quality.

Grazing has been the most extensive historic land use in the CESA, and this is expected to continue. Surface water impacts from grazing are both beneficial and adverse (BLM 2012a). These effects include additional herbaceous growth and diversity, livestock trampling in riparian areas, and reduced overall vegetative cover.

Irrigated agricultural lands occupy a small portion of the CESA (Section 3.19, Land Use and Access). Impacts to surface water include flow diversions from streams and springs, consumptive use by crops, and increased concentrations of TDS and agricultural chemicals in irrigation return flows.

Wildfires in the CESA have resulted in increased erosion and sedimentation, with attendant increases in turbidity and concentrations of suspended solids, dissolved solids, and temperature in area streams and ponds. Fire extent in the CESA is depicted in **Figure 3.2-3**. Most of the CESA has been burned, sometimes repeatedly, since 1980. From a watershed viewpoint, the most significant effect of these wildland fires is the loss of vegetation cover, which can lead to adverse changes in hillslope hydrologic function through decreased infiltration, increased runoff, and reduced soil quality. These conditions then lead to increased flooding, accelerated erosion, increased turbidity and sedimentation and increased nutrient loading in surface water (BLM 2012a).

The road network is extensive in the CESA. Potential cumulative impacts to runoff, erosion, and sedimentation are similar to those described for direct impacts. These existing effects include restricted drainage at road crossings of streams, modified drainage patterns, concentrated flow conditions that may accelerate erosion and sedimentation, sediment yielded from road maintenance, and water quality impacts from treatment chemicals (e.g., magnesium chloride) carried to nearby streams or riparian areas. These impacts affect streams such as Boulder Creek, Antelope Creek, Rock Creek, and Maggie Creek and their tributaries. Generally the severity of these impacts diminishes with distance and increasing watershed area away from roads.

Groundwater Resources

The cumulative effects to water resources resulting from historic, present, and projected future dewatering activities for mines in the CESA were evaluated in detail in the Cumulative Impacts Analysis report for dewatering and water operations (BLM 2000b) and in the Betze Project, Draft Supplemental EIS (BLM 2008a). These impact evaluations used a calibrated numerical model to simulate the combined or cumulative hydrologic effects associated with dewatering and water management activities at existing and proposed mines.

Newmont Nevada Energy Investment LLC (NNEI) operates the TS Power Plant in Boulder Valley. The power plant is a 242 megawatt coal-fired steam-turbine electric generation facility that commenced commercial power generation in June 2008. The design water requirement for the plant is approximately 2,400 gpm (the average water use since startup has averaged 1,400 gpm). The water required for the power plant is supplied from a primary production well located approximately 2 miles north of the plant site and two backup wells located closer to the plant. NNEI holds water rights to support TS Power Plant that allow a withdrawal rate of up to 5,565 gpm. The wells withdraw water from the alluvial basin fill aquifer in Boulder Valley. Depth to groundwater near the TS Power Plant varies from approximately 10 to 30 feet below surface. The alluvial water supply wells for the TS Power Plant operate outside of the area that is affected by drawdown associated with mine dewatering activities in the Carlin Trend. Therefore, water withdrawal for the TS Power Plant is unlikely to contribute to the cumulative drawdown associated with mine dewatering activities. Groundwater quality is acceptable for cooling water, which is the largest water use at TS Power Plant. NNEI maintains a potable water treatment system for arsenic removal and disinfection. Additionally, a reverse osmosis system with an associated ion exchange demineralizing circuit operated to produce boiler water. Wastewater for the facility is discharged to four double-lined evaporation ponds managed in accordance to NDEP discharge permit requirements. Because the lined evaporative ponds are permitted as a zero-discharge facility, the TS Power Plant operation is not expected to impact surface or groundwater quality (BLM 2014a).

3.4.3.3 Reconfiguration Alternative

Surface Water Resources

Cumulative impacts to surface water quantity and quality under the Reconfiguration Alternative would be the same as those described for the Proposed Action.

Groundwater Resources

Cumulative impacts to groundwater resources under the Reconfiguration Alternative would be the same as those described for the Proposed Action.

3.4.3.4 Livestock Fencing Alternative

Surface Water Resources

Cumulative impacts to surface water quantity and quality would be the same as those described for the Proposed Action.

Groundwater Resources

Potential cumulative impacts to groundwater resources under the Livestock Fencing Alternative would be essentially the same as those described for the Proposed Action.

3.4.3.5 No Action Alternative

Under the No Action Alternative, Springs SP-001, SP-002 and local perennial reaches associated with the spring discharge would be covered by the authorized WRDFs. Cumulative effects to surface water quantity and quality would approximate those identified in previous NEPA assessments for the CESA (BLM 2010a, BLM 2008a, BLM 2007a, BLM 2000c).

3.4.4 Potential Monitoring and Mitigation Measures

Issue: Review of limited groundwater elevation data in the vicinity of the proposed expansion of the King Pit and proposed QLC Pit suggests that there may be a potential for groundwater to flow into the western lobes of the King Pit and QLC Pit during mining and/or after closure under the Proposed Action and Reconfiguration Alternative. Depending on the inflow rates, groundwater inflows combined with runoff from the pit wall and direct precipitation may potentially provide sufficient flow to result in the development of pit lakes in one or both of the pits.

Four monitoring and mitigation measures (WR-1, WR-2. WR-3 and WR-4) are outlined below to address the potential for pit lake development or groundwater flow through backfill in portions of the pits. Prior to mining below the “threshold” elevations of 5,420 feet amsl elevation at the King Pit or 5,480 feet amsl elevation at the QLC Pit, the BLM would require that mitigation measures WR-1 and WR-2 would be completed to evaluate if a pit lake is likely to develop in one or both of the pits. If the results of WR-1 and WR-2 indicate that pit lakes are likely to develop then additional measures outlined in WR-3 and if necessary WR-4 would be completed as required by the BLM. The results of the monitoring and mitigation measures (including monitoring, aquifer testing, pit lake evaluation, pit water quality predictions, ecological risk assessment, and proposed mitigation plans) would be submitted to BLM and NDEP for review. BLM’s approval would be required to allow for any mining below the threshold elevations in either the King Pit or QLC Pit.

WR-1: Supplemental Groundwater Monitoring and Aquifer Testing. Prior to mining below the threshold elevation of 5,420 feet amsl for the King Pit or 5,480 feet amsl for the QLC Pit, HES would construct at least one or more additional groundwater monitoring wells within or in close proximity to the western lobes of each pit. The purpose of the wells would be to 1) further define the groundwater elevations in the vicinity of the deepest portions of each pit; and, 2) conduct aquifer testing to further characterize the hydraulic properties of the bedrock aquifer to be encountered in the lower portions of the pits. For planning purposes, the completion depth of the wells should extend to approximately 100 feet below the planned deepest pit floor elevation.

WR-2: Pit Lake Evaluation. The supplemental groundwater monitoring and aquifer testing data collected as outlined in WR-1 would be combined with other available data for the site to further evaluate if there is a potential for a pit lake to develop in one or both of the pits in the post-closure period. This evaluation would consider both existing conditions and projected fully recovered groundwater conditions in the post-mining period. If this evaluation determines that there is a potential for a pit lake to develop in one or both of the pits, then additional analysis (groundwater flow modeling or spreadsheet modeling) would be performed using methodology approved by the BLM to estimate the size, volume, surface elevation of the pit lake(s), lake surface area, and evaporative losses over time, and groundwater inflow and outflow of the pit lake(s) during pit filling and after the pit lake(s) approach steady-state conditions.

WR-3: Pit Lake Water Quality Evaluation. If the results of WR-2 predict that a pit lake would likely develop in one or both of the pits in the post-closure period, a hydrochemical model would be developed for the project to estimate water quality in the pit lake(s) over time as the pit fills and approaches steady-state conditions. The pit lake hydrochemical modeling would include inputs and reactions known to occur within pit lakes. These factors include, but are not limited to, the quality and quantity of groundwater inflow and outflow; chemical releases from oxidized wall rock and any waste rock material that may be used as backfill in the pit; aqueous chemical reactions in the pit lake; evaporation from the pit lake surface; direct precipitation into the lakes; and runoff from the pit walls. The results of the modeling would be used to predict pit lake water quality at representative points in time in the future as the lakes develop. The results of pit lake water quality predictions would be further evaluated to determine if the pit water quality poses any risk to adversely affecting downgradient groundwater quality; or adversely affecting human, terrestrial or avian life. This subtask would include incorporating the predicted pit lake water quality into a Screening Level Ecological Risk Assessment (SLERA) to determine if the pit lake water has the potential to adversely impact terrestrial or avian life.

WR-4: Pit Lake Mitigation. If the results of the analyses outlined in WR-3 predict that the pit lake water quality could potentially result in an adverse effect to downgradient groundwater quality, or adversely affect human, terrestrial or avian life, mitigation measures would be implemented to reduce or eliminate potential adverse effects. The mitigation measures implemented would depend on the pit lake water

quality predictions and could range from 1) reduction in the depth of open pit mining or partial pit backfilling to preclude pit lake development; 2) utilizing treatment options such as adding amendments to modify pit lake water quality concentrations; 3) measures designed to reduce exposure pathways or receptor access; and 4) other appropriate measures as approved by the BLM and NDEP. In addition, if the analyses outlined in WR-2 predicts that pit lake development is likely in either the King Pit, or QLC Pit, or both, potential impacts to water rights from long-term evaporation from the pit lake surface(s) would be mitigated by HES reserving sufficient post-mining water rights for the evaporative losses as determined in consultation with the NDWR.

Effectiveness: Conducting the additional monitoring outlined in WR-1 combined with the pit lake water quantity and quality analysis outlined in WR-2 and WR-3, and implementation of one or more mitigation measures as outlined in WR-4 (if necessary) would effectively eliminate or minimize the potential adverse impacts to downgradient groundwater quality, or other potential adverse impacts to human, terrestrial or avian life; and potential impacts to water rights.

3.4.5 Residual Impacts

No residual impacts are anticipated for surface water or groundwater resources. The existing streams are ephemeral and the contributing watershed areas are comparatively small and/or already disturbed. Control of process fluids and stormwater would be required and monitored according to state and federal permits. Impacts to groundwater supplies would be localized and recover over time after groundwater withdrawal ceases at mine closure.

3.5 Cultural Resources

3.5.1 Affected Environment

Cultural resources are locations of human activity, occupation, or use identifiable through field inventory (survey), historical documentation, or oral evidence. The term includes archaeological, historic, or architectural sites, structures, or places with important public and scientific uses, and may include definite locations (sites or places) of traditional, cultural, or religious importance to specified social and/or cultural groups, which includes Traditional Cultural Properties (TCPs) (see Section 3.6, Native American Traditional Values). Designated TCPs are an area of known past and present use by the Native Americans. In this case the designated TCPs are areas in which the Western Shoshone have revealed important confidential information as to the use of specified areas to the BLM (see Section 3.6.1.2, Native American Consultation and Coordination). Archaeological sites are defined as cultural resources in which evidence of past human activity is preserved and includes features or artifacts created or modified by humans. The line between prehistoric and historic-era archaeological sites in the Americas is generally defined as the point of time in a region when European contact occurred and thus writing systems were introduced to the peoples of that region. For the region under study, the historic era generally began as a result of fur-trapper investigations, government exploring excursions, and emigrants bound for California passing through the area beginning in the early 1800s. Cultural resources are definitive material places and things that are located, classified, ranked, and managed through the system of identifying, protecting, and utilizing the resources for public benefit.

The CESA for cultural resources encompasses an area extending south of the APE to Interstate 80, as well as approximately 12.5 miles north, 12 miles west, and 9.5 miles east, as shown in **Figure 3.5-1**, Cultural Resources Direct and Indirect APE and CESA. The CESA boundary is designed to include areas within which artifacts made with or from Tosawihi opalite comprise the majority of material found at archaeological sites (**Figure 3.5-1**).

3.5.1.1 Regulatory Framework

Federal historic preservation laws provide a legal environment for documentation, evaluation, and protection of cultural resources that may be affected by federal undertakings. The NEPA states that federal agencies shall take into consideration effects to the natural environment with respect to an array of resources, and that alternatives must also be considered. The courts have made clear that cultural resources are regarded as part of the natural environment. The National Historic Preservation Act (NHPA) of 1966, as amended, established the Advisory Council on Historic Preservation (ACHP) and NRHP. The NHPA mandates that federal agencies consider an undertaking's effects on cultural resources that are listed or eligible for listing on the NRHP, and Section 106 of the NHPA establishes a review process by which these resources are given consideration during the conduct of federal undertakings. Cultural resources that are listed or eligible for listing on the NRHP are referred to as historic properties.

3.5.1.2 Eligibility Criteria for Listing Properties on the NRHP

The NRHP, maintained by the National Park Service (NPS) on behalf of the Secretary of the Interior (Secretary), is the nation's inventory of historic properties. The NPS has established three main standards that a property must meet to qualify for listing on the NRHP: age, integrity, and significance. To meet the age criteria, a property generally must be at least 50 years old. To meet the integrity criteria, a property must "possess integrity of location, design, setting, materials, workmanship, feeling, and association" (36 CFR 60.4). Finally, a property must be significant according to one or more of the following criteria:

- Criterion A – Be associated with events that have made a significant contribution to the broad patterns of our history; or
- Criterion B – Be associated with the lives of persons significant in our history; or

- Criterion C – Embody the distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction; or
- Criterion D – Have yielded, or may be likely to yield, information important in prehistory or history.

3.5.1.3 Areas of Potential Effect

The study area for cultural resources includes the Area of Potential Effect (APE), and will hereafter be referred to in this section as either the direct or indirect effects APE. Under Section 106 of the National Historic Preservation Act (NHPA), the APE is defined as "those areas in which impacts are planned or are likely to occur. Specifically, the APE is defined as the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if any such properties exist. Additionally, the APE is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking," (36 CFR 800.16[d]).

The APE includes the following:

- All alternative locations for all elements of the proposed project;
- All locations in which the proposed project might result in ground disturbance;
- All locations from which elements of the proposed project (e.g., a facility or land disturbance) might be visible or audible;
- All locations in which the proposed project might change traffic patterns, land use, public access, etc.; and
- All areas in which direct or indirect effects might occur.

Direct Effect APE

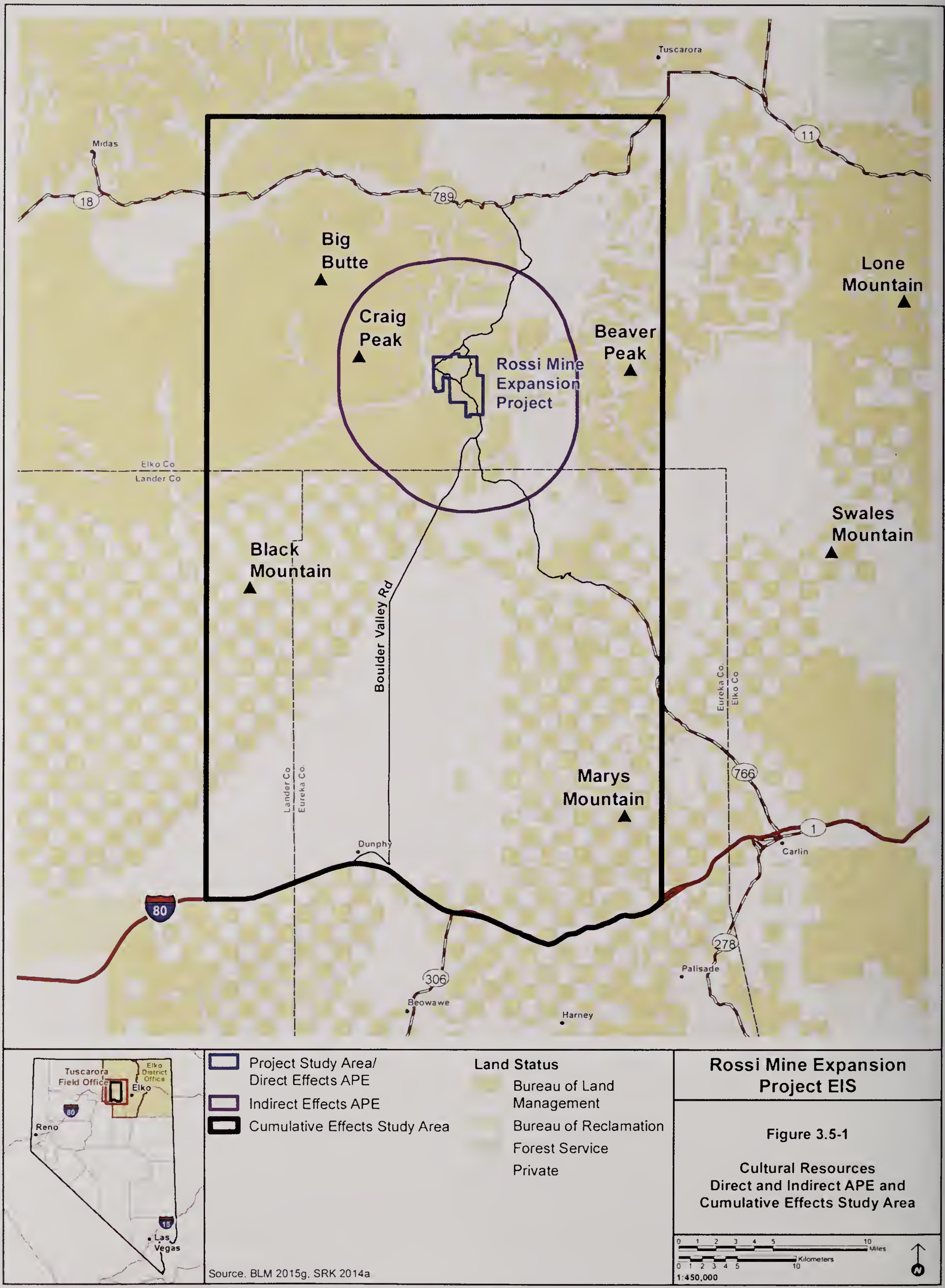
The direct effects APE for the proposed project encompasses the area within the proposed PoO boundary (3,731 acres) as shown in **Figure 3.5-1**. The direct effects APE was established because the area within the proposed PoO boundary is where the Proposed Action or physical on the ground surface disturbing activities would occur. All areas within the direct effects APE have been inventoried for cultural resources. Cultural resources located in this APE were reviewed to determine whether they would be subject to effects that could affect their eligibility for the National Register of Historic Places (NRHP).

Indirect Effects APE

The indirect effects APE consists of the direct effects APE plus the area within five miles of the proposed Rossi Mine PoO boundary for the expansion as shown in **Figure 3.5-1**. The indirect effects APE was established because the proposed project is visible from high points such as ridgetops and a few lower elevation areas within this five-mile radius around the project area. The noise created by the Proposed Action can also be heard, dependent upon atmospheric conditions, within in this five-mile area around the project area. Parts of the area within the indirect effects APE have not been inventoried for cultural resources because projects have not been proposed or implemented throughout the entire indirect effects APE. Class III cultural resource inventories are limited to the direct effects areas where projects have been proposed and currently exist, such as the Arturo Mine to the south, the Rodeo Creek Surface Exploration Project to the southwest, the Ren Surface Exploration to the southeast, Bootstrap Mine and Goldstrike Mine to the southeast, the powerlines to the north, east and west, and the pipeline to the east of the Rossi Mine. A few scattered road segments, range improvements, fire rehabilitation projects, and sporadic surface exploration projects conducted under 3809 Notice-level projects may or may not have had some limited cultural resource inventory in order to avoid archaeological sites. Section 3.5.3, Cumulative Impacts, presents a description of previous cultural resource inventories that have been conducted within the indirect effects APE and cultural resources CESA boundary.

Within the indirect effects APE that remains un-inventoried, there is the potential for archaeological historic properties to exist; therefore, the environment would also allow for potential TCPs to exist. The Western Shoshone have stated that ridge tops or high places such as mountain peaks are important locations to them to conduct prayers and ceremonies. They have also stated that springs, creeks, and

bodies of water are important places. This section, as well as Section 3.6, Native American Traditional Values discusses the TCPs within the indirect effects APE. The proposed project is visible from some ridge tops or mountain peaks and a few lower elevation areas within the indirect effects APE. The visibility of the project is dependent upon atmospheric conditions as well as the time of day or night and when the TCP is being used. The atmospheric conditions also determine how the sounds of the mining operation that can be heard (i.e., muffled, faint, low, sharp, constant, etc.) and where the sounds can be heard within the indirect effects APE (i.e., off in the distance, only from high points, directional, etc.). Atmospheric conditions include wind, sunlight, weather, lighting (i.e., daylight, dusk, dreary, bright, night time, etc.), and stable and unstable air currents, among others. The topography or terrain also dictates where and how the sounds from the mining and surface exploration activities can be heard, and the location of the equipment and facilities on the landscape dictates whether or not the equipment and activities are visible.



Rossi Mine Expansion Project EIS

Figure 3.5-1

Cultural Resources Direct and Indirect APE and Cumulative Effects Study Area

2/20/2018

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notice.

3.5.1.4 Cultural Overview

The direct effects APE is located within an area of rolling hills and ephemeral drainages between Antelope Creek to the west and Boulder Creek to the east. Elevations within the direct effects APE range from approximately 5,200 feet amsl to over 6,150 feet amsl with slopes ranging from two to sixty degrees. The project is located approximately 6.5 air miles north of the Little Boulder Basin area. The area is marked by the presence of two intermittent flowing creeks, Antelope Creek to the west and Boulder Creek to the east. Further description of the environmental setting including soils, flora, and fauna specific to the direct effects APE can be found in Harmon (2016) and are described in this document. The topography and terrain for the indirect effects APE is an extension of the direct effects APE consisting of rolling hills and intermittent and ephemeral drainages. As with the direct effects APE, the two main intermittent flowing creeks are Antelope Creek to the west and Boulder Creek to the east. Elevations within the indirect effects APE range from approximately 5,200 to 7,000 feet amsl. Further descriptions of the environmental setting including soils, flora, and fauna specific to the indirect effects APE are also described in this document.

Prehistoric Overview

Human occupation in the Rossi Mine direct and indirect APEs extends to the Paleoindian period, with increasing intensity of human habitation and exploitation during the Late Prehistoric and Protohistoric periods. Cultural phases represented in the region include Paleoindian (12,000 to 7,000 B.C.), Early Archaic (7000 to 3800 B.C.), Pie Creek (3800 to 2600 B.C.), South Fork (2600 to 850 B.C.), James Creek (850 B.C. to A.D. 700), Maggie Creek (A.D. 700 to 1300), and Eagle Rock (1300 A.D. to 1850+) (Harmon 2016).

Ethnographic Overview

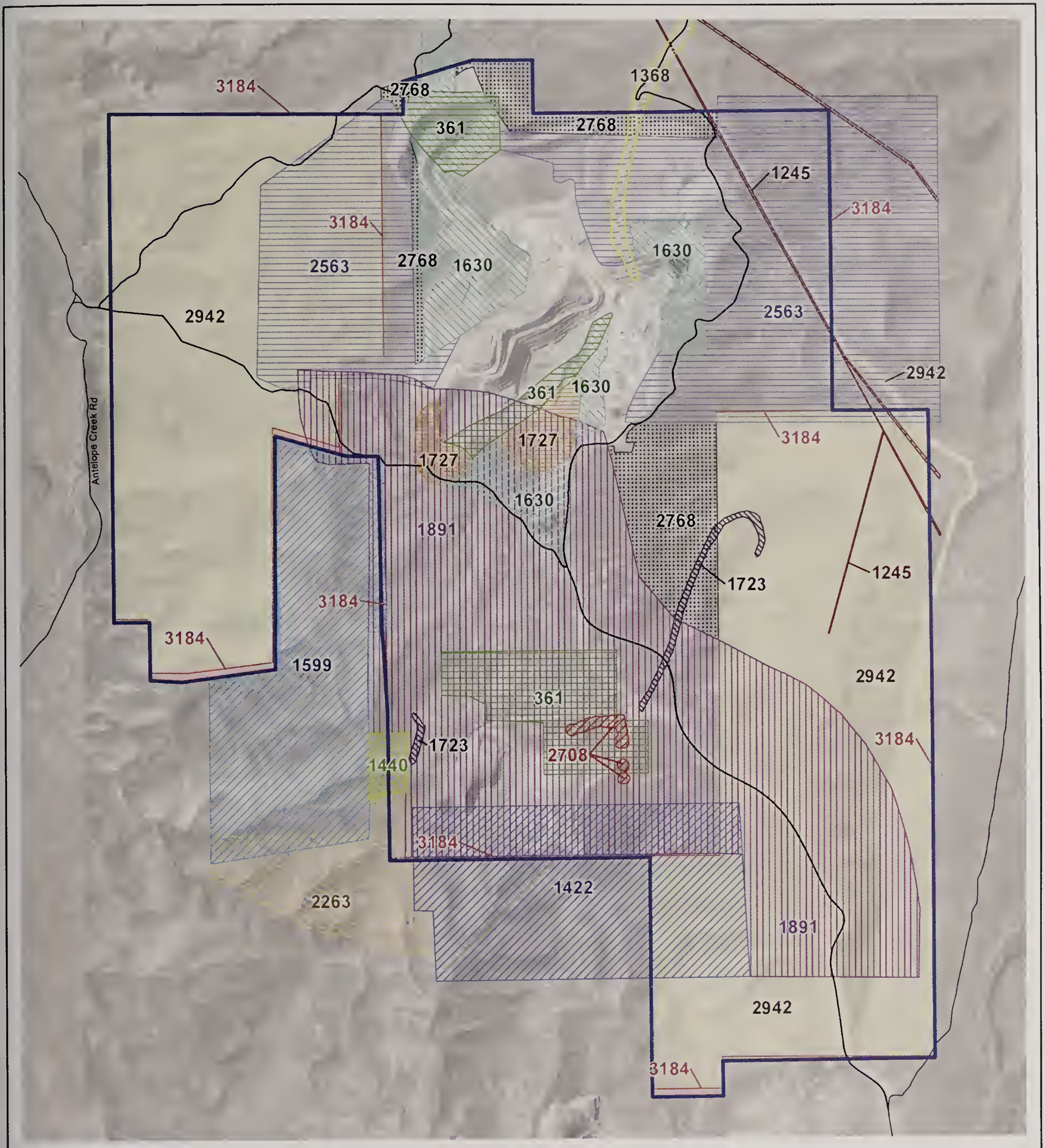
The historic ethnographic record indicates that the group most closely associated with the Rossi Mine direct and indirect effects APEs is the White Knife or Tosawihi, who are part of the Western Shoshone group and inhabited the area near Beowawe, Battle Mountain, Rock Creek, Willow Creek and Boulder Valley. The Tosawihi are often referred to as the White Knives after the high quality white opalite chert they quarried north of Antelope Creek (McBride and Tiley 2016) at the Tosawihi Quarries located approximately eight to nine air miles northwest of the project. The lifestyle of the Western Shoshone essentially was very similar to archaic people. The Tosawihi had a large range with varied resources, which they visited seasonally exploiting the resources that became available on a seasonal basis. They lived in small, family-sized groups most of the year (McBride and Tiley 2016). The presence of the Tosawihi Quarries placed Tosawihi people in a pivotal position as traders of this toolstone material. Tosawihi chert was a valuable item both for use and for trade. Toolstone was exchanged for access to hunting and fishing lands to the north and, in historic times, for horses (McBride and Tiley 2016). The Tosawihi area was also a hunting and gathering locale, and trips there were a part of the seasonal round of the White Knife people. However, as a consequence of seasonal exploitation patterns and short-term periods of occupation, archaeological evidence of prehistoric occupation across the landscape typically is sparse.

Historic exploration of the region began in the early 1800s, led by early fur trappers such as Peter Skene Ogden. Military expeditions in the middle part of 19th century, led by John C. Fremont, were the first significant exploration and mapping efforts in the region. By the 1840s, thousands of emigrants traveled along the Humboldt River in search of new opportunities in California. Gold strikes in Nevada brought the first Euroamericans into the Rossi Mine area, beginning sometime after 1859. Antonio Rossi and Carlo Cereghino of Battle Mountain discovered barite within the direct effects APE area during the 1930s, and development of this resource has occurred in the area since that period (Harmon 2016).

3.5.1.5 Class I Inventory (File Search)

The Rossi Mine direct effects APE for cultural resources encompasses approximately 3,731 acres, which have all been inventoried. A Class I Inventory was conducted through the Nevada State Historic Preservation Office (SHPO) in 2010 and found that between the years 1974 and 2009, a total of

24 cultural resource investigations were completed over and within one mile of the current project area. **Figure 3.5-2** shows the locations and corresponding report numbers of these surveys. Most of these investigations were Class III inventories with a few subsurface significance testing or treatment activities. In the 1980s, two partial site mitigation or data recovery projects were completed. Of these 24 investigations, 14 were partially or wholly located within the existing project area. At this time, most of the undisturbed portions of the existing project area had been previously surveyed for cultural resources (BLM 2010a). Up to 2010, the Section 106 Process and Native American Consultation had been completed on the existing cultural resource investigations. A total of 18 historic properties and one unevaluated site had been previously identified within the proposed PoO boundary for the Rossi Mine, including 13 historic properties within the existing PoO boundary, and five historic properties and one unevaluated archaeological site within the expansion areas of the proposed PoO boundary (BLM 2010a and Harmon 2016). Between the years of 2010 to 2015, testing and subsequent data recovery efforts were conducted at all 13 of the previously identified historic properties located within the existing PoO boundary, of which all were prehistoric lithic scatters (Schroedl 2015). The BLM, in consultation with the Nevada SHPO, determined that these 13 archaeological sites are no longer eligible for inclusion on the NRHP (Ernstein 2015). Consequently, none of these resources warrant further consideration. 26EK2304, 26EK2305, 26EK4873, 26EK7812, 26EK7820, 26EK10130, 26EK10135, 26EK10136, 26EK10137, 26EK10138, 26EK10139, 26EK11048, and 26EK12228.



Project Study Area

Cultural Survey #

- Report 1245
- Report 1368
- Report 1422
- Report 1440
- Report 1599
- Report 1630
- Report 1723
- Report 1727
- Report 1891
- Report 2263
- Report 2563
- Report 2708
- Report 2768 (PIII 2010)
- Report 2942
- Report 3184
- Report 361

Source: BLM 2010a, Harmon 2016, Harmon 2017, SRK 2014a.

Rossi Mine Expansion Project EIS

Figure 3.5-2

Cultural Resource Inventories within the Proposed Plan of Operation Boundary

0 0.1 0.2 0.3 0.4 0.5 Miles

0 0.25 0.5 0.75 1 Kilometers

1:30,000

N

11/13/2017

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notice

3.5.1.6 Class III Cultural Resources Inventory

In the spring of 2010 P-III Associates, Inc. conducted a Class III cultural resource inventory for the remainder of the current and proposed project area that had not yet been inventoried and for the undisturbed area within the direct effects APE boundary (Harmon 2016). At this time field visits and NRHP evaluations were also conducted at all previously identified sites within the proposed PoO boundary. In August of 2016 it was discovered that approximately 38 acres of previously unsurveyed areas existed within the proposed direct effects APE; therefore, a Class III inventory was completed to ensure the entire area within the proposed PoO boundary or direct effects APE has been inventoried (Harmon 2017).

The recent Class III inventories (Harmon 2016, 2017) resulted in the identification and recordation of 56 newly identified archaeological sites, the revisit and assessment of 39 previously documented archaeological sites, and the documentation of 23 newly identified isolated artifacts. The sections below summarize the findings of the cultural resource inventories within the direct effects APE boundary, including the identification and designation of potential TCPs within the direct and indirect effects APE. The Nevada SHPO concurred with the BLM's preliminary determinations of eligibility for archaeological sites in a letter dated January 25, 2017, for BLM report 1-2942 (Harmon 2016) and February 6, 2017, for BLM report 1-3184 (Harmon 2017).

Of the 95 archaeological sites documented as a result of the Class III inventories, 94 are located within the direct effects APE or proposed PoO boundary and one site (26EK4829) is located just outside of the direct effects APE. Of the 94 sites within the direct effects APE 13 have been determined eligible for listing on the NRHP under the Secretary's significance criteria D and six have been left unevaluated for NRHP eligibility (see **Table 3.5-1**). The BLM is deferring the NRHP eligibility determinations for these six unevaluated archaeological sites pending further site recordation and testing necessary to acquire sufficient information to make a NRHP eligibility determination. Cultural resources designated as unevaluated are treated as eligible sites (historic properties) until such time as further testing or research is completed in order to make an eligibility determination under the Secretary's significance criteria. **Table 3.5-1** below summarizes the archaeological sites determined to be eligible or left unevaluated for NRHP listing. **Table 3.5-1** also states the BLMs determination of effects for eligible and unevaluated archaeological sites in relation to the Proposed Action and direct effects APE.

Table 3.5-1. NRHP Eligible and Unevaluated Sites Identified During Class III Inventory

Site Number	NRHP Status	Location	Determination of Effects
26EK2309 CrNV-12-1805	Unevaluated	Within disturbance footprint	Unknown; site testing required
26EK4829 CrNV-12-7200	Unevaluated	Located outside of direct effects APE	No Adverse Effect
26EK4831 CrNV-12-7202	Unevaluated	Not in disturbance footprint or within 50 meters of disturbance footprint	No Adverse Effect
26EK5297 CrNV-12-10487	Unevaluated	Not in disturbance footprint or within 50 meters of disturbance footprint, but could be indirectly effected by the Dawn WRDF	Unknown; site testing required
26EK10147 CrNV-12-9992	Unevaluated	Not in disturbance footprint or within 50 meters of disturbance footprint	No Adverse Effect
26EK11039 CrNV-12-14225	Unevaluated	Not in disturbance footprint or within 50 meters of disturbance footprint	No Adverse Effect

Table 3.5-1. NRHP Eligible and Unevaluated Sites Identified During Class III Inventory

Site Number	NRHP Status	Location	Determination of Effects
26EK13059 CrNV-12-16593	Unevaluated	Not in disturbance footprint or within 50 meters of disturbance footprint	No Adverse Effect
26EK10146 CrNV-12-9991	Eligible – D	Within 50 meters of disturbance footprint	Adverse Effect
26EK11035 CrNV-12-9950	Eligible – D	Within disturbance footprint	Adverse Effect
26EK11048 CrNV-12-14234	Eligible – D	Not in disturbance footprint or within 50 meters of disturbance footprint	No Adverse Effect
26EK13031 CrNV-12-16565	Eligible – D	Not in disturbance footprint or within 50 meters of disturbance footprint	No Adverse Effect
26EK13054 CrNV-12-16588	Eligible – D	Within disturbance footprint	Adverse Effect
26EK13057 CrNV-12-16591	Eligible – D	Within 50 meters of disturbance footprint	Adverse Effect
26EK13062 CrNV-12-16596	Eligible – D	Not in disturbance footprint or within 50 meters of disturbance footprint	No Adverse Effect
26EK13063 CrNV-12-16597	Eligible – D	Not in disturbance footprint or within 50 meters of disturbance footprint	No Adverse Effect
26EK13070 CrNV-12-16604	Eligible – D	Not in disturbance footprint or within 50 meters of disturbance footprint	No Adverse Effect
26EK13073 CrNV-12-16607	Eligible – D	Not in disturbance footprint or within 50 meters of disturbance footprint	No Adverse Effect
26EK13081 CrNV-12-16615	Eligible – D	Not in disturbance footprint or within 50 meters of disturbance footprint	No Adverse Effect
26EK13083 CrNV-12-16617	Eligible – D	Not in disturbance footprint or within 50 meters of disturbance footprint	No Adverse Effect
26EK13084 CrNV-12-16618	Eligible – D	Not in disturbance footprint or within 50 meters of disturbance footprint	No Adverse Effect

Sources: Peterson 2017; Palmer 2017.

Of the 94 archaeological sites documented within the direct effects APE boundary, **Table 3.5-2** presents the 70 sites that have been determined not eligible for NRHP listing under the Secretary's criteria for evaluation, including a segment of historic road (26EK11610/CrNV-12-14544) documented within the direct effects APE. This segment of historic road does not embody any of the Secretary's significance criteria (i.e., A-D, inclusive) and is not eligible for NRHP listing. The unidentified portions of this historic road located outside of the direct effects APE remain unevaluated.

Table 3.5-2. NRHP Ineligible Archeological Sites

26EK4828 CrNV-12-7189	26EK4844 CrNV-12-7729	26EK4845 CrNV-12-7740	26EK4864 CrNV-12-7742	26EK4867 CrNV-12-7745
26EK4870 CrNV-12-7762	26EK5468 CrNV-12-10509	26EK5471 CrNV-12-10522	26EK7803 CrNV-12-8462	26EK7811 CrNV-12-8480
26EK10118 CrNV-12-9933	26EK10119 CrNV-12-9934	26EK10120 CrNV-12-9935	26EK10132 CrNV-12-9957	26EK10133 CrNV-12-9958
26EK10144 CrNV-12-9979	26EK10145 CrNV-12-9990	26EK10148 CrNV-12-9993	26EK10149 CrNV-12-9994	26EK11036 CrNV-12-14222
26EK11037 CrNV-12-14223	26EK11040 CrNV-12-14226	26EK11622 CrNV-12-14557	26EK11623 CrNV-12-14558	26EK13030 CrNV-12-16564
26EK13032 CrNV-12-16566	26EK13033 CrNV-12-16567	26EK13034 CrNV-12-16568	26EK13035 CrNV-12-16569	26EK13036 CrNV-12-16570
26EK13037 CrNV-12-16571	26EK13038 CrNV-12-16572	26EK13039 CrNV-12-16573	26EK13040 CrNV-12-16574	26EK13041 CrNV-12-16575
26EK13042 CrNV-12-16576	26EK13043 CrNV-12-16577	26EK13044 CrNV-12-16578	26EK13045 CrNV-12-16579	26EK13046 CrNV-12-16580
26EK13047 CrNV-12-16579	26EK13048 CrNV-12-16580	26EK13049 CrNV-12-16583	26EK13050 CrNV-12-16584	26EK13051 CrNV-12-16585
26EK13052 CrNV-12-16586	26EK13053 CrNV-12-16587	26EK13055 CrNV-12-16589	26EK13056 CrNV-12-16590	26EK13058 CrNV-12-16592
26EK13060 CrNV-12-16594	26EK13061 CrNV-12-16595	26EK13064 CrNV-12-16598	26EK13065 CrNV-12-16599	26EK13066 CrNV-12-16600
26EK13067 CrNV-12-16601	26EK13068 CrNV-12-16602	26EK13069 CrNV-12-16603	26EK13071 CrNV-12-16605	26EK13072 CrNV-12-16606
26EK13074 CrNV-12-16608	26EK13075 CrNV-12-16609	26EK13076 CrNV-12-16610	26EK13077 CrNV-12-16611	26EK13078 CrNV-12-16612
26EK13079 CrNV-12-16613	26EK13080 CrNV-12-16614	26EK13082 CrNV-12-16616	*26EK11610 CrNV-12-14544	26EK15436 CrNV-12-18592

*Non-eligible segment of site.

Table 3.5-3 presents archaeological sites previously identified by recent Class III cultural resource inventories that could not be relocated.

Table 3.5-3. Archeological Sites Unable to be Relocated

26EK7799 CrNV-12-8448	26EK7805 CrNV-12-8464	26EK7806 CrNV-12-8465	26EK7808 CrNV-12-8467	26EK7814 CrNV-12-8483

Table 3.5-4 presents previously identified cultural resources that were not revisited during the recent Class III inventories because they are defined as isolated artifacts per Appendix H of the 2014 State Protocol Agreement and are properties categorically determined not eligible for listing on the NHRP.

Table 3.5-4. Archeological Isolates Not Revisited during Recent Class III Inventory

26EK1506 CrNV-01-270	26EK1528	26EK4863 CrNV-01-7741	26EK7800 CrNV-01-8449	26EK7801 CrNV-01-8460
26EK7802 CrNV-01-8461	26EK7804 CrNV-01-8463	26EK7807 CrNV-01-8466	26EK7809 CrNV-01-8468	26EK7810 CrNV-01-8469

In addition to the archaeological sites identified during the Class III inventories, four TCPs were identified by the BLM as a result of information sharing and its government-to-government consultation efforts, as documented in Section 3.6, Native American Traditional Values, to exist in or adjacent to the direct effects APE (**Table 3.5-5**). Nevada SHPO concurred with the preliminary eligibility determination of these four TCPs in a letter dated February 23, 2017 (Palmer 2017). The Secretary's significance criteria used to determine the eligibility of individual TCPs are stated in the table below. Three of these four TCPs are located primarily within the proposed PoO boundary for the project and are as follows:

- Prayer Land or Praying Place [Nanisuntehain Sokopin] (CrNV-12-18615);
- Morning Sunrise Prayer Place [Imaa Tapaito'l Nanisuntehain] (CrNV-12-18616); and
- The Monster Grave/Antelope Creek Coming in Prayer Place [Tso'apittseh Nakuu/Kwaheten Okkaikkinne Yuampitch Nanisuntehain] (CrNV-12-18618).

The Sage Grouse Dance Place/Chicken Dance Ground TCP [HuittsanNekka/Tsikkina Nekkah] (CrNV-12-18617) is located primarily outside the direct effects APE, but does have portions that overlap the direct effects APE. Two other TCPs that were designated in 2016 exist within the indirect effects APE boundary and are completely outside of the direct effects APE. These are the Hunter's Spring (CRNV-12-18443) and Velvet Canyon-Doctor's House (CRNV-12-18444). These two TCPs would not be adversely affected by the indirect effects created by the Proposed Action.

Table 3.5-5. Traditional Cultural Properties Identified within the Direct and Indirect Effects APEs

Site Number	Site Description	NRHP Status	Location	Determination of Direct Effects	Determination of Indirect Effects
CrNV-12-18615	Prayer Land or Praying Place TCP *Nanisuntehain Sokopin*	Eligible (under criteria A)	Large portion located within the disturbance footprint	Adverse Effect	Adverse Effect
CrNV-12-18616	Morning Sunrise Prayer Place TCP *Imaa Tapaito'I Nanisuntehain*	Eligible (under criteria A)	Partially located within the disturbance footprint	Adverse Effect	Adverse Effect
CrNV-12-18617	Sage Grouse Dance Place/ Chicken Dance Ground TCP *HuittsanNekka/ Tsikkina Nekkah*	Eligible (under criteria A)	Small portion located within disturbance footprint	No Adverse Effect	No Adverse Effect
CrNV-12-18618	Monster Grave/ Antelope Creek Coming in Prayer Place TCP *Tso'apittseh Nakuu/Kwaheten Okkaikkinne Yuampitch Nanisuntehain*	Eligible (under criteria A and B per consideration c)	Large portion located within the disturbance footprint	Adverse Effect	Adverse Effect
CrNV-12-18443	Hunter's Spring TCP	Eligible (under criteria A and D)	Located within the indirect effects APE – approximately 3 to 4 miles away from the proposed PoO	No Adverse Effect	No Adverse Effect
CrNV-12-18444	Velvet Canyon-Doctor's House TCP	Eligible (under criteria A and D)	Located within the indirect effects APE – approximately 3 to 4 miles away from the proposed PoO	No Adverse Effect	No Adverse Effect

Sources: Peterson 2017; Palmer 2017.

On March 29, 2017, the BLM sent letters to the tribes listed below in order to initiate consultation regarding the preliminary determination of effects for the historic properties identified in the two cultural resource inventory reports (BLM 1-2942[p] and 1-3184[p]) and the TCPs stated above. This letter was sent to the tribal councils for the Te-Moak Tribe of Western Shoshone, Battle Mountain Band, Elko Band, South Fork Band, Wells Band, Confederated Tribes of the Goshute Indian Reservation, Duckwater Shoshone Tribe, Ely Shoshone Tribe, Shoshone-Bannock Tribes of the Fort Hall Indian Reservation, Fort McDermitt Paiute-Shoshone Tribes of Nevada and Oregon, Shoshone-Paiute Tribes of the Duck Valley Indian Reservation, Timbisha Shoshone Tribe of Death Valley, and Yomba Shoshone Tribe. The tribes were given a thirty-day comment period from receipt of the certified letter. The BLM received response

letters from the Duckwater Shoshone Tribe, Battle Mountain Band Council, and the South Fork Band Council as summarized in **Table 3.6-1**, Summary of Native American Consultation and Coordination for the Rossi Mine Expansion Project, in Section 3.6, Native American Traditional Values. A field tour was held on June 15, 2017, per the request of the Battle Mountain Band at the Rossi Mine to discuss the project. Representatives from the Battle Mountain Band and South Fork Band attended the field tour, although the invitation for the tour was sent to the Te-Moak Tribe of Western Shoshone, Battle Mountain Band, Elko Band, South Fork Band, Wells Band, and Shoshone-Paiute Tribes of the Duck Valley Indian Reservation. The main focus of discussion was reclamation of the proposed facilities, including concurrent reclamation and final reclamation. The final determination of effects letter was mailed to SHPO and the councils for the Te-Moak Tribe of Western Shoshone, Battle Mountain Band, Elko Band, South Fork Band, Wells Band, Confederated Tribes of the Goshute Indian Reservation, Duckwater Shoshone Tribe, Ely Shoshone Tribe, Shoshone-Bannock Tribes of the Fort Hall Indian Reservation, Fort McDermitt Paiute-Shoshone Tribes of Nevada and Oregon, Shoshone-Paiute Tribes of the Duck Valley Indian Reservation, Timbisha Shoshone Tribe of Death Valley, and Yomba Shoshone Tribe on September 12, 2017 (Peterson 2017). The BLM received no response in regards to the final determination of effects letter from the tribal councils. The Nevada SHPO concurred with the BLM's findings in a letter dated October 17, 2017 (Palmer 2017).

3.5.2 Environmental Consequences

Primary effects pertaining to historic properties located within the direct effects APE include ground-disturbing activities associated with construction of the proposed project and its effects to unknown historic properties that may be discovered during project construction.

Potential effects to historic properties are assessed using the "criteria of adverse effect, no adverse effect, and no effect" (36 CFR 800.5[a][1]), which states, "An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association."

There are five broad categories of effect:

1. Physical destruction or alteration of a property or relocation from its historic location;
2. Isolation or restriction of access;
3. Change in the character of the property's use or of physical features within the property's setting, or the introduction of visible, audible, or atmospheric elements that are out of character with the significant historic features of the property;
4. Neglect that leads to deterioration or vandalism; and
5. Transfer, sale, or lease from federal to non-federal control, without adequate and legally enforceable restrictions or conditions to ensure the preservation of the historic significance of the property.

A finding of No Adverse Effect occurs "when the undertaking's effects do not meet the criteria of paragraph (a)(1) of this section [quoted above] or the undertaking is modified or conditions are imposed, such as the subsequent review of plans for rehabilitation by the SHPO/Tribal Historic Preservation Office (THPO) to ensure consistency with the Secretary's Standards for the Treatment of Historic Properties (36 CFR part 68) and applicable guidelines, to avoid adverse effects," (36 CFR 800.5(b)). A finding of No Effect would occur "if the agency official finds that either there are no historic properties present or there are historic properties present but the undertaking would have no effect upon them, as defined in 36 CFR 800.11(d)," (36 CFR 800.4(d)(1)).

Under NEPA, effects to historic properties can be direct or indirect. Direct effects can be caused by an undertaking and occur at the same time and place (40 CFR 1508.8[a]). These types of effects to historic properties consist of physical damage resulting from surface-disturbing activities including construction of the project, transportation and utility corridor creation, and effects from wastewater discharges and erosion, which can occur to both known sites and unknown subsurface sites. Surface exploration

activities also could result in direct effects to historic properties from ground disturbance, such as damage due to blading, driving through a site, erosion, and looting. Indirect effects are caused by an undertaking and are later in time or farther removed in distance, but are still reasonably foreseeable (40 CFR 1508.8[b]). These types of effects often are not quantifiable and can occur both within and outside of the direct effects APE. In general, indirect effects to historic properties are often a result of an increase in public access to areas containing archaeological sites from the creation of new roads in support of development. This greater public access increases the risk of unauthorized collection of artifacts and intentional or unintentional vandalism (Headquist and Ellison 2010, Nickens et al. 1981, Spangler et al. 2006). Potential indirect physical effects on cultural resources also could result from changes in erosion patterns due to construction, soil compaction, or vegetation removal; light pollution, noise; fugitive dust; and off-road vehicle traffic associated with construction or maintenance activities.

Direct and indirect effects to TCPs can also occur. These effects are determined based on the type of use employed to evaluate and make the effects determination for a specific TCP. The effects are compared to the existing conditions and how the proposed project creates a change or degree of change to the setting, accessibility, and use of the TCP. Therefore, physical ground disturbing activities within a TCP may or may not cause an effect to the TCP. These effects can be harder to evaluate due to the confidentiality of the information used to designate a TCP. Therefore, the effects to TCPs in both the direct and indirect effects APE stated in this document are assumptions based on data and information available to the BLM in assessing possible effects that could occur.

3.5.2.1 Proposed Action

Potential Effects

Surface disturbance associated with proposed mining and surface exploration activities, construction of ancillary and support facilities, and haul roads could result in direct effects such as those described above to historic properties. The proposed project would result in a total of 2,063 acres of surface disturbance including 51 acres of road realignment. Surface disturbance could result in direct effects from the vertical and horizontal displacement of soil containing cultural resources. These effects could cause a potential for a site to be adversely affected due to the resulting loss of integrity, loss of information, and alteration of a site's setting. Surface-exposed sites identified through Class III inventories prior to construction that are currently unevaluated would be evaluated for NRHP eligibility and, if found eligible, appropriately mitigated. **Table 3.5-6** presents the 19 known NRHP-eligible and unevaluated historic properties located within the direct effects APE which have the potential to be adversely affected by the Proposed Action and BLM recommended mitigation.

Table 3.5-6. NRHP-Eligible and Unevaluated Archaeological Sites within the Rossi Mine Direct Effects APE[1]

Site Number	NRHP Status	Location	Mitigation Recommendation
26EK2309 CrNV-12-1805	Unevaluated	In disturbance footprint	Subsurface testing and possible mitigation required.
26EK4831 CrNV-12-7202	Unevaluated	Not in disturbance footprint or within 50 meters of disturbance footprint	Avoidance. Subsurface testing and NRHP evaluation required.
26EK5297 CrNV-12-10487	Unevaluated	Not in disturbance footprint or within 50 meters of disturbance footprint	Avoidance. Subsurface testing and NRHP evaluation required.
26EK10146 CrNV-12-9991	Eligible	Not in disturbance footprint or within 50 meters of disturbance footprint	Avoidance. No additional action required.
26EK10147 CrNV-12-9992	Unevaluated	Not in disturbance footprint or within 50 meters of disturbance footprint	Avoidance. Subsurface testing and NRHP evaluation required.
26EK11035 CrNV-12-9950	Eligible	In disturbance footprint	Mitigation required.
*26EK11039 CrNV-12-14225	Unevaluated	Not in disturbance footprint or within 50 meters of disturbance footprint	Avoidance. Site revisits, testing and NRHP evaluation required.
26EK11048 CrNV-12-14234	Eligible	Not in disturbance footprint or within 50 meters of disturbance footprint	Avoidance. No additional action required.
26EK13031 CrNV-12-16565	Eligible	Not in disturbance footprint or within 50 meters of disturbance footprint	Avoidance. No additional action required.
26EK13054 CrNV-12-16588	Eligible	In disturbance footprint	Mitigation required.
26EK13057 CrNV-12-16591	Eligible	Within 50 meters of disturbance footprint	Mitigation required.
26EK13059 CrNV-12-16593	Unevaluated	Not in disturbance footprint or within 50 meters of disturbance footprint	Avoidance. Subsurface testing and NRHP evaluation required.
26EK13062 CrNV-12-16596	Eligible	Not in disturbance footprint or within 50 meters of disturbance footprint	Avoidance. No additional action required.
26EK13063 CrNV-12-16597	Eligible	Not in disturbance footprint or within 50 meters of disturbance footprint	Avoidance. No additional action required.
26EK13070 CrNV-12-16604	Eligible	Not in disturbance footprint or within 50 meters of disturbance footprint	Avoidance. No additional action required.
26EK13073 CrNV-12-16607	Eligible	Not in disturbance footprint or within 50 meters of disturbance footprint	Avoidance. No additional action required.
26EK13081 CrNV-12-16615	Eligible	Not in disturbance footprint or within 50 meters of disturbance footprint	Avoidance. No additional action required.
26EK13083 CrNV-12-16617	Eligible	Not in disturbance footprint or within 50 meters of disturbance footprint	Avoidance. No additional action required.
26EK13084 CrNV-12-16618	Eligible	Not in disturbance footprint or within 50 meters of disturbance footprint	Avoidance. No additional action required.

*Site 26EK11039 (CrNV-12-14225) there are two locations for this site requiring further investigation.

Within the surface disturbance footprint for the Proposed Action, the eligible and unevaluated archaeological sites that would be adversely affected and require subsurface testing and/or mitigation are 26EK2309 (CrNV-12-1805), 26EK11035 (CrNV-12-9950), and 26EK13054 (CrNV-12-16588). These three historic properties would be adversely affected by the implementation of the Proposed Action, as they are located within the proposed disturbance footprint. The archaeological historic property 26EK13057 (CrNV-12-16591) is located within 50 meters from the edge of the proposed surface disturbance and would be mitigated as it is likely to be adversely affected by direct and indirect effects

created by the Proposed Action. The eligible archaeological historic properties located outside of the mining operation surface disturbance footprint and beyond 50 meters from the edge of the proposed surface disturbance would be avoided and would not be adversely affected by the proposed mining operations. Although surface exploration activities could occur anywhere within the proposed PoO boundary, HES proposes to avoid historic properties when conducting surface exploration activities. Therefore, surface exploration activities would not adversely affect any archaeological historic properties within either the direct or indirect effects APEs. However, if proposed surface activities are unable to avoid eligible historic properties, efforts would be taken to mitigate any adverse effects to these historic properties.

The potential for the discovery of unanticipated archaeological deposits during construction activities exists within proposed disturbance areas and could result in direct adverse effects. Unanticipated discoveries could result in displacement or loss (either complete or partial) of the discovered archaeological material. Displacement of archaeological deposits affects the potential to understand the context of the site and therefore limits the ability to extrapolate data regarding settlement and subsistence patterns.

The Proposed Action also could result in indirect effects on NRHP-eligible cultural resource sites within both the direct and indirect effects APEs from increased human activity, access, and traffic as a result of mine expansion. This increased public access could result in vandalism, including illegal artifact collection, in the study area.

Other potential indirect effects on the archaeological historic properties from the proposed project include: 1) dust from the equipment, vehicles, traffic, and blasting that could cover the cultural material that is exposed on the ground within at least 100 feet from the edge of a road and possibly farther away dependent upon the wind; 2) damage to down gradient historic properties that may occur from erosion during the construction of mine facilities, vegetation removal, and high intensity precipitation events that cause sheet wash or heavy runoff; 3) construction activities that may cause wildlife and livestock to change travel patterns creating new trails through historic properties that can cause damage to sites; and, 4) burrowing animals that may move into nearby historic properties causing damage to the sites as construction, mining, and exploration activities are implemented.

The potential for direct effects from the proposed project to the indirect effects APE archaeological resources is slight and may only occur on the northern end of the project area where the WRDF is near the PoO boundary. Otherwise, there is considerable distance between the proposed and existing facilities and the area of the indirect effects APE. Indirect effects in the indirect effects APE would be the same as discussed above ensuing from dust, wildlife, and livestock movement changes as a result of the mining operations activities and changes in erosion patterns due to high intensity precipitation events and the implementation of the Proposed Action for archaeological sites.

Potential direct and indirect effects to the TCPs within the direct and indirect APEs are described in Section 3.6.2, Environmental Consequences, of the Native American Traditional Values section (Section 3.6) of this document.

The direct effect to the three TCPs located primarily within the direct effects APE is the potential loss of access to the TCP while the Rossi Mine project is active. Due to regulations to protect the safety of the mine employees and the public, access to the TCPs may be restricted and limited. The primary indirect effects to the TCPs located within the direct and indirect effects APE is the audible noise from the equipment as well as the mining and exploration operations, which could interfere with prayers and ceremonies being held in the area, and the potential visual interference such as dust from vehicles, equipment, blasting, and night lighting interfering with the darkness of the night sky. Construction of WRDFs could interfere with maintaining a line of sight between Morning Sunrise Prayer Place TCP (CrNV-12-18616) and important geographical peaks surrounding the area (e.g., Big Butte, Black Mountain, Beaver Peak, etc.), a concern of Western Shoshone. Unless information from the Western Shoshone is provided to the BLM regarding the direct effects to the TCPs, the actual direct effects may remain unknown.

There would be little direct effect to the Sage Grouse Dance Place/Chicken Dance Ground TCP as a result of the proposed mining operation because this TCP is primarily located beyond the direct effects

APE boundary. During reclamation of the King North WRDF there may occur a small amount of encroachment into the TCP as a result of regrading, recontouring, and seeding of the WRDF during reclamation activities. The effects to this TCP would be mostly indirect, consisting of audible and visual effects, such as noise and possibly limited views of other areas of importance to the Western Shoshone. The current height of the King WRDF currently blocks views to the south and west of this TCP. As stated above, the indirect effects on the Sage Grouse Dance Place/Chicken Dance Ground TCP would be the same as those for the other three TCPs.

Resolution of Effects

A total of 19 eligible or potentially eligible archaeological sites were documented within the direct effects APE. Thirteen of these sites have been determined eligible for the NRHP and six are unevaluated. All 19 eligible or unevaluated resources in the direct effects APE are deemed eligible or potentially eligible under Criterion D of Section 106 only for their potential to yield data. These resources do not qualify for inclusion in the NRHP for their integrity of feeling or setting, and effects to these aspects of integrity due to auditory or visual changes in the landscape would not constitute adverse effects to these historic properties (Harmon 2016). Further, as mentioned above in **Table 3.5-6**, only four of these historic properties are within the boundaries of the proposed disturbance, or within 50 meters of the edge of the proposed disturbance, and would be adversely affected by the expansion of the Rossi Mine.

The Proposed Action would affect four out of the 19 NRHP eligible or unevaluated archaeological sites: 26EK2309 (CrNV-12-1805), 26EK11035 (CrNV-12-9950), 26EK13054 (CrNV-12-16588), and 26EK13057 (CrNV-12-16591). Three of these historic properties (26EK2309, 26EK11035, and 26EK13054) are located completely or partially within the footprint of disturbance, and one within 50 meters of the proposed disturbance (26EK13057). These historic properties would require mitigation according to the Historic Properties Treatment Plan (HPTP) prior to project implementation. Further work at these sites may include archaeological testing and oral testimony from Tribal members to justify a formal NRHP evaluation, and data recovery at sites determined eligible for the NRHP under Criterion D. The Proposed Action would also affect the potential burial site, which would require mitigation. Therefore, either the HPTP developed for the historic properties stated above would address the treatment of this potential burial site or a separate HPTP would be developed to address the potential burial site, as determined appropriate by the BLM. The remaining 15 eligible and unevaluated archaeological sites would not be adversely affected by the Proposed Action because all proposed and expected ground disturbance would avoid these sites. **Table 3.5-6** lists all 19 of the NRHP-eligible or unevaluated sites in the direct APE and relates the recommended mitigation for each site.

If, in the future, avoidance of these historic properties is not possible due to changes in mine design, alternatives, surface exploration activities, or unanticipated activities, adverse effects to these historic properties would need to be reassessed and possibly result in data recovery. Unavoidable adverse effects to archaeological historic properties located within or adjacent to the direct effects APE boundary would be mitigated or treated with the use of a BLM and SHPO-approved HPTP.

A HPTP is being developed and would be evaluated by the BLM for the archaeological sites mentioned above that would be adversely affected by the Proposed Action. Although adverse effects to these historic properties would be mitigated through data recovery, some of the data about the properties would be lost. The HPTP would be sent to the SHPO and tribes in conformance with the Section 106 Process.

HES could propose surface exploration activities anywhere within the direct effects APE boundary; therefore, a buffer zone, determined by the BLM in consultation with HES, would be established around the archaeological cultural resources sites in order to avoid damage to these sites from the surface exploration activities. The standard avoidance buffer zone would be 30 meters or determined on a case-by-case basis by the BLM. The buffer would be established around the perimeter of the historic properties eligible for inclusion on the NRHP in order to avoid damage to archaeological historic properties eligible for the NRHP. Prior to the implementation of surface exploration activities, a cultural resource management firm in consultation with the BLM archaeologist would be required to relocate archaeological historic properties on the ground and flag the buffer or exclusion zone around the site in order for the archaeological site to be avoided during the construction of roads and drill sites. During construction activities, best management practices such as, but not limited to, installing jersey barriers, silt fencing,

temporary fencing, and flagging and t-posts may be used to mark the edge of a buffer to make a visible barrier to provide avoidance and protect archeological sites. Once the construction activity is complete, the visible barrier would be removed. Another means of protection could be to fence off the drill site location, which identifies the area in which the drilling operation can proceed and designates the avoidance area to historic properties.

Indirect effects to the NRHP-eligible archaeological sites as a result of the implementation of the project could result in monitoring by BLM and HES and/or mitigation by HES in order to prevent damage or the loss of data for the site. Protection measures may also be installed up gradient or around a site such as, but not limited to, silt fencing, straw waddles, or straw bales to protect a site from erosion. During implementation of the Proposed Action and archaeological site monitoring, if it is determined that direct or indirect effects to the historic properties is occurring then protection measures or mitigation would be implemented to provide protection or data recovery of the historic properties. Archeological site 26EK5297 (CrNV-12-10487) may be affected indirectly as a result of the construction of the Dawn WRDF. Construction of the Dawn WRDF would cause a change to the natural drainage pattern, which would direct flow from storm events into this archaeological site. Therefore, this site would require monitoring and may require mitigation or data recovery.

To date, the Western Shoshone have not provided information on the timing of use by the Western Shoshone tribal members for any of the four TCPs in or adjacent to the direct effects APE. Therefore, it is unknown when the TCPs are used by Western Shoshone tribal members. When and if the time of use is disclosed to the BLM, discussions between the BLM, HES, and the tribes can occur to develop a possible time restriction to allow for the use of the TCP by Western Shoshone tribal members. Because the Western Shoshone are concerned that the Monster Grave/Antelope Creek Coming in Prayer Place [*Tso'apittseh Nakuu/Kwaheten Okkaikkinne Yuampitch Nanisuntehain*] (CrNV-12-18618) would be disturbed by mining operations and exploration activities creating vibration to the ground, the location identified on the ground as the Monster Grave would be avoided as it is a contributing element of CrNV-12-18618.

In order to lessen the visual effects created by the mining operations and exploration activities, concurrent reclamation of mine and exploration facilities would be initiated as soon as possible. Concurrent reclamation may occur in the form of the bottom layer and/or a side of the WRDF being reclaimed while another area of the WRDF is in operation. It could also be the reclamation of a facility that is no longer needed or active in the operation. The reclamation activities would consist of completing the earthwork activities such as recontouring, resloping or reshaping, and seeding the recontoured area of the facility.

A memorandum of agreement (MOA) among the BLM, Nevada SHPO, and HES is being developed for the proposed project regarding the Section 106 process and cultural resources. The draft MOA would be available for review once completed. Until then, Section 106 of the NHPA and the Nevada State Protocol would be in effect (BLM and Nevada SHPO 2014). As directed by Section 106 of the NHPA and the Nevada State Protocol, if any NRHP-eligible sites would be adversely affected by the Proposed Action, the adverse effects would be appropriately mitigated. For NRHP-eligible sites in proposed disturbance areas, site avoidance is the preferred method of mitigation. Where avoidance is not feasible, appropriate mitigation measures would be identified by the BLM in consultation with the Nevada SHPO and other appropriate parties (e.g., interested tribes) in accordance with the Nevada State Protocol (BLM and Nevada SHPO 2014). Appropriate mitigation measures could include data recovery, photo documentation, site stabilization, monitoring, protective barriers and signs, relocation, and adaptive reuse. Implementation of appropriate mitigation measures would eliminate or minimize project-related adverse effects on NRHP-eligible cultural resources. Data derived through mitigation could provide beneficial information on prehistoric and historic uses and cultural resource sites in the direct and indirect effects APE, as well as contribute to the regional database for cultural resources.

As provided in the Applicant Committed Environmental Protection Measures, archaeological sites would be protected from surface-disturbing activities by an exclusion zone determined by a BLM archaeologist until the BLM assess whether the site is eligible for listing on the NRHP. HES would not conduct any surface-disturbing activities within the exclusion zone without authorization from the BLM for all sites determined to be NRHP-eligible. If the site is determined not to be eligible, or the BLM determines that existing, cultural surveys are sufficient to conclude that no eligible sites exist; HES may conduct

surface-disturbing activities upon notification by the BLM. If any previously unknown archaeological sites or human remains associated or unassociated funerary objects or sacred objects, or objects of cultural patrimony as defined in the Native American Graves Protection and Repatriation Act (NAGPRA) (25 U.S.C. 3001) are discovered during construction, all construction activities would immediately cease within 100 meters or 330 feet of the discovery, and the BLM Authorized Officer and/or county law enforcement would be notified of the find to ensure compliance with all applicable laws regarding such a discovery. If the BLM determines, in consultation with SHPO, that the site is or may be eligible for the NRHP, a BLM archaeologist would determine an exclusion zone adequate to protect the resource. Construction would not resume in the area of the discovery until the BLM Authorized Officer issued a Notice to Proceed.

3.5.2.2 Reconfiguration Alternative

Effects to and resolution of effects to archaeological cultural resources and TCPs under the Reconfiguration Alternative would be similar to those effects as described for the Proposed Action. Activities associated with the Reconfiguration Alternative would result in 1,912 acres of surface disturbance (**Table 2-17**), which is 151 acres less than the Proposed Action, and would have the potential to disturb five archaeological sites that are NRHP eligible sites. Three of the five archaeological sites are located within the disturbance limits and two are within 50 meters of the edge of the proposed disturbance. The three archaeological sites that would be directly affected by the Reconfiguration Alternative are 26EK2309 (CrNV-12-1805), 26EK11035 (CrNV-12-9950), and 26EK13054 (CrNV-12-16588), and the two archaeological sites that are located within 50 meters from the edge of the proposed disturbance are 26EK10146 (CrNV-12-9991) and 26EK13057 (CrNV-12-16591). The potential loss of access to the Prayer Land or Praying Place TCP (CrNV-12-18615) would be greatly reduced under this alternative as there would be significantly less surface disturbance within the TCP compared with the Proposed Action. The potential for indirect effects to eligible cultural resources and TCPs under the Reconfiguration Alternative would be similar to those indirect effects as described under the Proposed Action.

3.5.2.3 Livestock Fencing Alternative

Under the Livestock Fencing Alternative, in addition to the mining and exploration activities proposed under the Proposed Action or the Reconfiguration Alternative, a fence would be installed around the perimeter of the mine facilities to exclude livestock as shown in **Figure 2-15**. Approximately 7 acres of surface disturbance would result from fence construction. Three historic properties, one eligible archaeological site, and two TCPs would be affected by the Livestock Fencing Alternative. These include archaeological site 26EK11048 (CrNV-12-14234), Sage Grouse Dance Place TCP (CrNV-12-18617) and Monster Grave TCP (CrNV-12-18618). This fence would have direct adverse effects at the eligible archaeological site and Monster Grave TCP. If this alternative were chosen, any potential unavoidable adverse effects to cultural resources would be mitigated as described for the Proposed Action. The direct and indirect effects to archaeological cultural resources TCPs within the direct and indirect effects APEs would be similar to those as described for the Proposed Action. The fence would provide a defined area that would designate the mining operational area and the area outside of the immediate mine operational area. Restrictions, such as MSHA regulation and other agency imposed regulations, would apply to the area inside the fence. Exceptions would be blasting zones, which still may involve areas outside the fence, but these restrictions are of a short duration and would only apply during the time of blasting to protect the public.

3.5.2.4 No Action Alternative

Exploration, mining, and processing activities as currently authorized for the existing Rossi Mine would continue under the No Action Alternative, but the proposed project would not be developed. The No Action Alternative would include reclamation and closure for existing and authorized mining disturbance, and the reclamation of surface exploration activities, under the terms of the current permits and approvals.

3.5.3 Cumulative Impacts

The CESA for cultural resources is defined in Section 3.5.1, Affected Environment. The past, present, and reasonably foreseeable future actions (RFFAs) are discussed in Section 3.2, Past, Present, and Reasonably Foreseeable Future Actions. Areas of existing mining development and exploration disturbance within the Carlin Trend are presented in **Figure 3.2-1**. Mining and mineral resource-related surface disturbance acreages associated with past, present, and RFFAs are identified in **Table 3.2-1**. Locations of past, present, and RFFAs for both mining and some ROW actions are displayed in **Figure 3.2-2**. Specific information regarding cumulative impacts within the project cultural resources CESA in relation to potential effects under the proposed project are presented in the following sub-sections.

As described above in the Resolution of Effects section, cultural resources inventories are conducted for any federal actions, and adverse effects to historic properties would be avoided or mitigated as appropriate. Avoidance of sites determined eligible for the NRHP is the preferred mitigation measure when sites are threatened by proposed disturbance. When possible, mining-related facilities are redesigned to avoid NRHP-eligible sites. However, avoidance is not always possible. In such cases, archaeological excavation or other forms of data recovery are performed by professional archaeologists to mitigate adverse effects. The archaeologists prepare treatment plans, which include the proposed methodology for data recovery, for submittal to and review by the BLM.

Cultural resources have been cumulatively impacted by many factors including past and present mining and energy development, road construction, livestock grazing, range improvements, recreational use, and wildfires. **Table 3.5-7** presents a summary of information on cultural resource inventories that have been conducted by other previous, present, and reasonably foreseeable mining projects located within the Rossi Mine Expansion Project EIS CESA for cultural resources.

Table 3.5-7. Summary of Cultural Resources Inventories within the Cultural Resources CESA

Project Name	Source	Year	Number of Inventories	Total Acres Inventoried	Total Number of Cultural Resources/Sites Recorded	Total Number of Resources/Sites Identified w/in the APE[1]	Number of NRHP Eligible Sites w/in the APE
Rossi Mine Expansion Project[2]	Draft EIS	2017	22	3,693	33	20	15
Newmont South Operations Area Project	Final EIS	1993	137	10,770	1,811	37	3
Newmont South Operations Area Project Amendment	Final EIS	2002	25	14,077	81	8	5
Newmont Gold Company Carlin Exploration Project	Environmental Assessment	1996	13	4,712	37	7	5
Newmont Pete Project	Environmental Assessment	2002	24	1,848	22	12	4
Leeville Project	Final Supplemental EIS	2010	16	748	19	14	6
Newmont High Desert Project	Environmental Assessment	1992	6	26	48	48	4
Newmont Chevas Exploration Project	Environmental Assessment	1993	2	1,920	26	19	1
Newmont Lantern Mine Expansion Project	Environmental Assessment	1995	3	1,340	11	11	0
Newmont Section 36 Project EA	Environmental Assessment	1995	5	960	4	4	0
Betze Project	Draft Supplemental EIS	2000	3	1,717	NI	NI	NI
Bootstrap Mine Project	Draft EIS	1996	20	1,202	56	56	16
Ren Exploration Project	Environmental Assessment	1997	2	1,840	9	0	0
Rossi Mine South WRDF Expansion Project	Environmental Assessment	1993	1	30	1	0	0
Trio Gold-Minorca Resources Rodeo Creek Exploration	Environmental Assessment	1998	1	555	19	19	2
North Elko Pipeline Project[4]	Environmental Assessment	2012	NI	NI	NI	NI	NI
Dee Gold Mine Expansion Project	Environmental Assessment	1993	10	240	23	23	6

Table 3.5-7. Summary of Cultural Resources Inventories within the Cultural Resources CESA

Project Name	Source	Year	Number of Inventories	Total Acres Inventoried	Total Number of Cultural Resources/Sites Recorded	Total Number of Resources/Sites Identified w/in the APE[1]	Number of NRHP Eligible Sites w/in the APE
Betze Mine Project	Final EIS	1991	6	6,745	262	64	0[3]
Rossi Mine Exploration Project	Environmental Assessment	1991	2	670	47	6	2
Dee Gold Mine Expansion Project	Environmental Assessment	1991	9	4,382	107	107	14
Ivanhoe/USX Access Road Project	Environmental Assessment	1988	1	26	28	23	5
Ivanhoe/USX Mine Project	Environmental Assessment	1988	3	1,463	189	74	56
Newmont Blue Star	Environmental Assessment	1989	2	1,340	11	11	0
Hollister Development Block	Environmental Assessment	2004	2	107	29	10	0
Dee Gold Mine Expansion Project III	Environmental Assessment	1997	10	NI	23	7	0
Newmont Mill #4 Project	Environmental Assessment	1988	1	90	7	7	0
Arturo Mine Project	Draft EIS	2012	NI	3,627	162	29	25
Hollister Underground Mine Project	Draft EIS	2012	50	10,168	202	28	23
Betze Pit Expansion Project	Draft Supplemental EIS	2008	9	10,370	13	8	5
Total			**385**	**84,666**	**3,280**	**652**	**200**

[1] APE is defined as the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if any such properties exist.

[2] Pending SHPO concurrence.

[3] Sites within the APE were not evaluated for NRHP eligibility at the time of analysis.

[4] Class III surveys were not performed at the time of the EA; surveys were to be performed under the Programmatic Agreement under development.

NI = No Information available.

As shown in **Table 3.5-7**, a total of 385 cultural resource investigations have been conducted on approximately 84,666 acres of the cultural resources CESA. Most of these acres of survey have been located on publically managed lands while a small minority of acres consist of privately owned land involved in mining operations. A total of 3,280 individual cultural resources were identified as a result of these surveys including archaeological sites, historic shelters, and isolated lithic scatters. Of the 3,280 identified cultural resources, a total of 652 were located within the established APE for each project. Of those 652 cultural resources located within the APE of each project, 200 were reviewed and determined to be eligible for inclusion on the NRHP. The majority of NRHP eligible cultural sites within the respective mining APEs have undergone mitigation (BLM 2016c). NRHP eligible sites that may have not been mitigated include sites located within Hollister mining and surface exploration areas located at the northern extent of the project's cultural resources CESA and a few other mines and surface exploration projects. Notable cultural sites within the CESA include the James Creek shelter, which was mitigated under the Gold Quarry Mine expansion in the 1980's, and the Lynn Creek archeological site consisting of can scatters and mine workings resulting from local historic placer mining in the early 1900's.

As other RFFAs occur within the CESA, it is anticipated that the additional cultural resources and sites would be located and inventoried. The density of cultural resource locations varies across the CESA but have been observed to occur at increased densities in the northern portion of the CESA, near the Tosawihi quarries (BLM 2016c).

Road construction results in soil compaction, altered surface water drainage, and erosion that could potentially affect cultural resources located within the CESA. Also, livestock trampling and range improvements may affect cultural sites in the CESA, as can certain vegetation treatments like burning or plowing. Recreational use, particularly off-road vehicle travel, has the potential to damage cultural resources in the CESA, and increases the probability of vandalism and illegal collection of artifacts. Wildlife could damage cultural resource sites in the CESA by digging and developing trails or paths through them. Wildfires can be especially destructive to cultural resources. Effects to cultural resources by wildfire are dependent upon the fire intensity, duration of heat, heat penetration into the soil, and the composition of the cultural resource material. Direct effects from wildfire can range from scorching, destruction by burning cultural materials to ash, causing discoloration and the development of a dull dark patina on cultural materials, breaking and spalling, and causing disfiguration or structural damage to cultural materials. Wildfire can also affect the thermoluminescence and obsidian hydration dates of cultural materials. Indirect effects from fires can result in erosion and displacement of artifacts. Direct and indirect effects can also occur from wildfire suppression activities such as retardant drops causing a corrosive reaction; construction of dozer-lines, hand-lines, mop-up and rehabilitation activities destroying objects by blading and digging activities; and exposing sites that make them vulnerable to looting.

Table 3.5-8 presents a summary of the acreages of surface disturbance within the cultural resources CESA resulting from past, present, and RFFA mining projects and other infrastructure developments in addition to the acreages of previous wildfires. Cultural resource inventories on public lands within the CESA are driven by projects being conducted by the federal agencies or proposed by a member of the public. Inventories on private land occur when the private lands are involved in a federal action.

Table 3.5-8. Acreages of Cumulative Surface Disturbances within the Cultural Resources CESA

CESA	Total Acres	Acres or Habitat Disturbed by Fire	Acres Disturbed by the Proposed Action	Acres Disturbed by the Reconfiguration Alternative	Acres Disturbed by Mining Operations (Past, Present, and RFFAs)	Acres Disturbed by Utility and Energy Development (Past, Present, and RFFAs)
Cultural Resources	641,000	78,452	1,167	1,016	48,500[1]	12,500

[1] Includes Notice-level activities.

3.5.3.1 Proposed Action

In compliance with Section 106 of the NHPA, cultural resources investigations were conducted for the Proposed Action. A total of 19 historic properties, including 13 NRHP eligible historic properties and six unevaluated (but presumed eligible for the purposes of Section 106), were identified in proposed disturbance areas within the direct effects APE. Potential adverse effects to these sites, as described in Section 3.5.2.1, Proposed Action, would represent an incremental increase in the overall adverse effect to cultural resources within the CESA. In addition to archaeological historic properties, TCPs have been identified within the direct and indirect effects APEs and CESA through consultation with the Western Shoshone. Detailed information regarding TCP historic properties is presented in Section 3.6, Native American Traditional Values.

As discussed in the Applicant Committed Environmental Protection Measures presented in **Table 2-16**, the BLM would determine which cultural sites need to be monitored and would establish an exclusion zone around each site eligible for the NRHP. Specific sites that have been designated as requiring mitigation are presented in **Table 3.5-6**. HES would not conduct any surface-disturbing activities within the exclusion zones without authorization from the BLM for all sites determined to be NRHP-eligible. If the site is determined to be not eligible, or the BLM determines that existing cultural surveys are sufficient to conclude that no eligible sites exist, HES may conduct surface-disturbing activities upon notification by the BLM. As further discussed in **Table 2-16** and in the Resolution of Effects subsection under Section 3.5.2.1, Proposed Action sites that cannot be avoided through the redesign of mine features would be preserved through a BLM and SHPO-approved treatment plan for data recovery. If data recovery is necessary to mitigate unavoidable adverse effects to an historic property, the process would recover a substantial amount of data but ultimately the historic property would be destroyed by the undertaking preventing future opportunities for scientific research, preservation, or public appreciation. HES would arrange for and fund a cultural resource management firm, which can be the same firm as that hired to complete the recordation and data recovery, to monitor on an annual basis the remaining historic properties among those listed above that have not undergone treatment. If the monitoring reveals that a historic property has experienced damage, then that historic property would undergo treatment within the first year after discovery of the damage.

Data recovery mitigates the potential loss of information associated with a historic property, but the effects are still adverse. Archaeological excavations of numerous sites currently are being conducted at many mines and other past, present, and RFFAs (e.g., utility and energy development) within the CESA; consequently, a portion of the archaeological record would no longer be available for public interpretation or future investigations. Over time, this represents a cumulative loss.

3.5.3.2 Reconfiguration Alternative

Cumulative effects under the Reconfiguration Alternative would be similar to cumulative impacts to cultural resources as described for the Proposed Action.

3.5.3.3 Livestock Fencing Alternative

Three historic properties, one eligible archaeological site, and two TCPs would be affected by the Livestock Fencing Alternative. These include archaeological site 26EK11048 (CrNV-12-14234), Sage Grouse Dance Place TCP (CrNV-12-18617) and Monster Grave TCP (CrNV-12-18618). This fence would have direct adverse effects at the eligible archaeological site and Monster Grave TCP. These impacts are in addition to cumulative impacts associated with the Proposed Action or Reconfiguration Alternative.

3.5.3.4 No Action Alternative

Cumulative effects under the No Action Alternative would be similar to cumulative effects to cultural resources as described for the Proposed Action.

3.5.4 Potential Monitoring and Mitigation Measures

Unavoidable adverse effects to known archaeological historic properties identified within the direct effects APE would be mitigated in accordance with a BLM and SHPO approved HPTP. Archaeological historic

properties that would be affected by the project within the indirect effects APE may also receive monitoring and mitigation if necessary. Any previously unknown archaeological historic properties that may be discovered during construction activities would be treated with a BLM and SHPO approved HPTP. These include the implementation of treatment plans approved by BLM and SHPO for sites that cannot be avoided through the redesign of mine features for data recovery, as well as monitoring of those sites for which the BLM determines monitoring is required. Further, the BLM would establish a buffer or exclusion zone around each archaeological site eligible for the NRHP. The standard avoidance buffer zone would be 30 meters or may be determined on a case-by-case basis by the BLM. Additionally, the BLM would require monitoring by a third party cultural resources management firm to be conducted on an annual basis at the historic properties that have not undergone treatment and, if monitoring reveals that any of these historic properties have experienced damage, treatment would be performed within the first year after discovery of damage. No additional monitoring or mitigation measures are proposed for this resource.

The potential burial site would undergo treatment or data recovery, the procedures implemented would follow NAGPRA and other appropriate regulations.

The BLM acknowledges that certain effects cannot be fully mitigated to the satisfaction of the tribes. Adverse effects to religious, spiritual, or sacred values cannot be monitored or mitigated. The BLM recognizes that land disturbance from the mining and exploration activities would disrupt “puha” a spiritual power important to the well-being of the Western Shoshone people. Removal of items of importance or significance, although not sacred objects under the definition in NAGPRA (43 CFR 10.2(b)(5)), could be partially mitigated by having tribal representatives review and possibly curate these items.

The TCPs were designated by the BLM based on information received from and communications with the Western Shoshone regarding the use of specific locations. The use information is confidential. The Western Shoshone have not provided the BLM with a time of use. Therefore, the BLM is unable to impose timing restrictions for the use of the TCPs. As a result, the assumption is that the use is seasonal and occurs at various times when the Western Shoshone travel through or are in the area. HES and the tribes may be able to negotiate an agreement between them designating an area outside of the mine area that is near the TCPs where the Western Shoshone could participate in the use of the TCP until such time as reclamation and closure activities have been completed at the mine site and the mine is closed.

The potential monitoring and mitigation measures stated above would provide for the data recovery of archaeological historic properties that would be adversely affected by the proposed project. Mitigating archaeological sites would recover data that would otherwise be lost. The potential monitoring would also provide a means to evaluate whether or not the other archaeological historic properties that are not adversely affected are being protected or are receiving damage. Avoiding the location of the Monster Grave/Antelope Creek Coming in Prayer Place would protect the area from excavation or ground disturbance. Conducting concurrent reclamation of the WRDF and other mining and exploration facilities as soon as possible to restore and rehabilitate disturbed ground would lessen the visual effects. If arrangements can be made between HES and the tribes to temporarily use a suitable place outside of the mine operations area so that it is not subject to MSHA regulations and is safe, then this would allow the Western Shoshone the opportunity to continue to use the TCPs while the mining operation is active.

3.5.5 Residual Effects

The proposed project would result in the loss of cultural resources, some that are not eligible for the NRHP and others that are. Although non-eligible sites would be recorded to BLM standards and the information integrated into local and statewide databases before approval for surface-disturbing activities is given, the sites ultimately would be destroyed by project construction. Adverse effects to any NRHP-eligible site identified within the direct effects APE that cannot be avoided through the redesign of mine features or relocation of surface exploration activities would be mitigated through a BLM and SHPO approved treatment plan. Although historic properties would be mitigated through implementation of data recovery, some of the cultural values associated with these sites cannot be fully mitigated; therefore, it is anticipated that residual effects would occur to these resources as some data would still be lost.

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3.6 Native American Traditional Values

Ethnographic resources are associated with the cultural practices, beliefs and traditional history of a community. In general, ethnographic resources include places in oral histories or traditional places, such as particular rock formations, the confluence of two rivers, or a rock cairn; large areas, such as landscapes and viewsheds; sacred sites and places used for religious practices; social or traditional gathering areas, such as dance areas; natural resources, such as plant materials or clay deposits used for arts, crafts, or ceremonies; and places and natural resources traditionally used for non-ceremonial uses, such as trails or camping locations.

3.6.1 Affected Environment

The study area or APE for the direct effects to Native American traditional values is the area within the proposed PoO boundary (**Figure 3.6-1**). The direct effects APE was established as the area within the PoO boundary because this is where the proposed activities would occur. The indirect effects APE consists of the direct effects area plus a five mile area surrounding the proposed Rossi Mine PoO boundary because the existing and proposed facilities can be seen from varying locations within this area around the mine site, especially at high points such as ridge tops and from some locations within the Tosawihi Quarries (**Figure 3.6-1**). Noise from mining operations may also be heard from various locations within the 5-mile area around the existing and proposed mining operations. The CESA for Native American traditional values encompasses an area extending south of the direct effects APE to Interstate 80, as well as approximately 12.5 miles north, 12 miles west, and 10 miles east of the project area (**Figure 3.6-1**). This area was determined to be the CESA as it includes viewsheds from prominent mountain tops identified as important to the Western Shoshone and their connection to the Tosawihi Quarries in addition to other important places in the area of the Rossi Mine. Also, this area for the CESA is based on the distribution of Tosawihi material, and includes places where Tosawihi material was procured and used by the Western Shoshone.

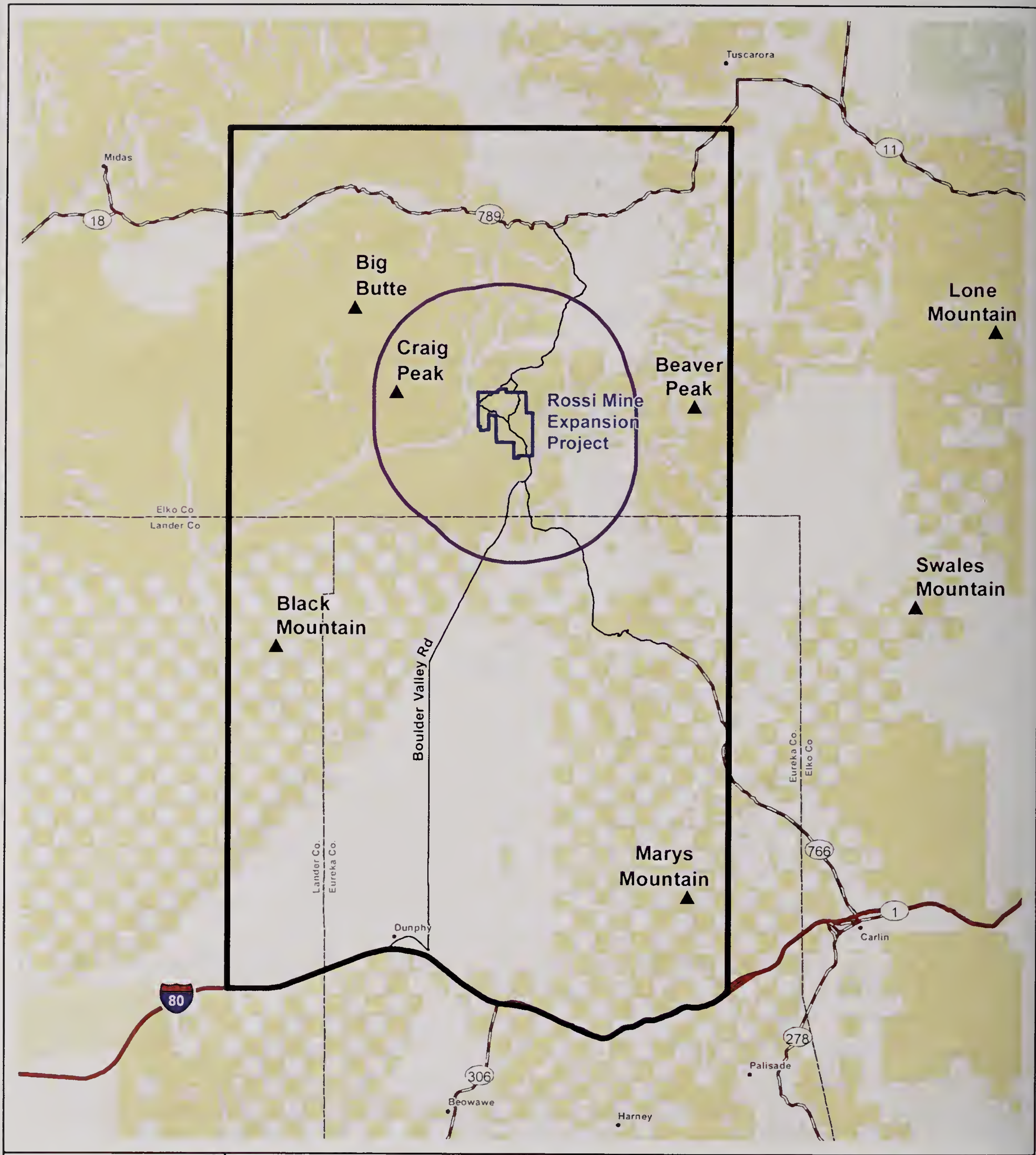
3.6.1.1 Regulatory Framework

Federal law and agency guidance require BLM to consult with Native American tribes concerning the identification of cultural values, religious beliefs, and traditional practices of Native American people that may be affected by actions on BLM-administered lands. This consultation includes the identification of places (i.e., physical locations) of traditional cultural importance to Native American tribes. Places that may be of traditional cultural importance to Native American people include, but are not limited to:

- Locations associated with the traditional beliefs concerning tribal origins, cultural history, or the nature of the world;
- Locations where religious practitioners go, either in the past or the present, to perform ceremonial activities based on traditional cultural rules or practice;
- Ancestral habitation sites;
- Trails;
- Burial sites; and
- Places from which plants, animals, minerals, and waters believed to possess healing powers or used for other subsistence purposes, may be taken.

Some of these locations may be considered sacred to particular Native American individuals or tribes.

As a federal agency, BLM shares in the general federal trust responsibility articulated by the U.S. Supreme Court. Because the study area does not include any tribally owned lands or mineral resources, or lands or minerals held in trust by the federal government for the benefit of Indian tribes, BLM adheres to its federal trust responsibility by complying with the general regulations and statutes set forth below.



Project Study Area/ Direct Effects APE

Indirect Effects APE

Cumulative Effects Study Area

Land Status

Bureau of Land Management

Bureau of Reclamation

Forest Service

Private

Source: BLM 2015g, SRK 2014a

Rossi Mine Expansion Project EIS

Figure 3.6-1

NATV Direct and Indirect APE and Cumulative Effects Study Area

0 1 2 3 4 5 10 Miles

0 1 2 3 4 5 10 Kilometers

1:450,000

N

2/20/2018

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notice.

In 1992, the NHPA was amended to explicitly allow that "properties of traditional religious and cultural importance to an Indian tribe may be determined to be eligible for inclusion on the NRHP." If a resource has been identified as having importance in traditional cultural practices and the continuing cultural identity of a community, it may be considered a traditional cultural property (TCP). The term "traditional cultural property" first came into use within the federal legal framework for historic preservation and cultural resource management in an attempt to categorize historic properties containing traditional cultural significance. To qualify for nomination to the NRHP, a TCP must:

- Be a place with definable boundaries;
- Retain integrity; and
- Meet certain eligibility criteria as outlined for cultural resources in the NHPA (Section 3.5, Cultural Resources).

Through ongoing consultation and information sharing between the BLM and representatives of affiliated bands of Te-Moak Tribe of Western Shoshone Indians of Nevada, consisting of the Battle Mountain Band, Elko Band, South Fork Band and members of the Shoshone-Paiute Tribes of the Duck Valley Indian Reservation, the BLM and tribal representatives (tribal council members, tribal members, and elders) have identified areas that are of religious and cultural importance to the tribes. The BLM has evaluated four sites identified by the Western Shoshone representatives and concluded that portions of these areas are eligible for inclusion in the NRHP as TCPs.

In addition to NRHP eligibility, places of cultural and religious importance also must be evaluated to determine if they should be considered under other federal laws, regulations, directives, or policies. These include, but are not limited to, NAGPRA of 1990, American Indian Religious Freedom Act (AIRFA) of 1978, Archaeological Resources Protection Act (ARPA) of 1979, and EO 13007 (Sacred Sites) of 1996.

NAGPRA established a means for Native Americans, including Indian tribes, to request the return of human remains and other sensitive cultural items held by federal agencies or federally assisted museums or institutions. NAGPRA also contains provisions regarding the intentional excavation and removal of, inadvertent discovery of, and illegal trafficking in Native American human remains and sensitive cultural items.

AIRFA established a federal policy of protecting and preserving the inherent right of individual Native Americans to believe, express, and exercise their traditional religions including, but not limited to, access to sites, use and possession of sacred objects, and the freedom to worship through ceremonials and traditional rites.

ARPA requires notification of the appropriate Indian tribe before approving a cultural resource use permit for the excavation (testing and data recovery) of archaeological resources, if the responsible federal land manager determines that a location having cultural or religious importance to the tribe may be harmed or destroyed.

EO 13007 defines a sacred site as any specific, discrete, narrowly delineated location on federal land that is identified by an Indian tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion, provided that the tribe or appropriately authoritative representative has informed the federal agency of the existence of such a site.

EO 13007 requires federal agencies "to the extent practicable, permitted by law, and not clearly inconsistent with essential agency functions," to "(1) accommodate access to and ceremonial use of such sacred sites by Indian religious practitioners and (2) avoid adversely affecting the physical integrity of such sacred sites." To implement these requirements, federal agencies must, "where practicable and appropriate," . . . "implement procedures, . . . to ensure reasonable notice is provided of proposed actions or land management policies that may restrict future access to or ceremonial use of, or adversely affect the physical integrity of, sacred sites."

3.6.1.2 Native American Consultation and Coordination

In compliance with the NHPA, as amended, the BLM initiated NHPA government-to-government consultation for the Rossi Mine Expansion Project EIS on May 26, 2015, by sending letters to the following tribal groups: Te-Moak Tribe of Western Shoshone, Battle Mountain Band Council, Elko Band Council, South Fork Band Council, Wells Band Council, Confederated Tribes of the Goshute Indian Reservation, Duckwater Shoshone Tribe, Ely Shoshone Tribe, Fort McDermitt Paiute-Shoshone Tribes of Nevada and Oregon, Shoshone-Bannock Tribes of the Fort Hall Indian Reservation, Shoshone-Paiute Tribes of the Duck Valley Indian Reservation, Timbisha Shoshone Tribe of Death Valley, and Yomba Shoshone Tribe. Letters were sent to inform the various tribal groups of the proposed undertaking and to solicit their concerns regarding the possible presence of properties of cultural, religious, and/or traditional importance to the tribes in the proposed study area. In addition, the BLM sent letters to the Western Shoshone Committee, Western Shoshone Defense Project (WSDP), Western Shoshone Cultural Advisory Group, Western Shoshone Descendants of Big Smoky, and BIA-Eastern Nevada Agency to inform them of the proposed project. **Table 3.6-1** lists the Native American groups participating in the consultation process and information sharing for this project, including the dates on which the BLM has exchanged dialogue with these groups. Additional details of ongoing consultation or coordination with area tribes and their representatives are maintained in the BLM consultation records for this project; this information is considered confidential.

The BLM consulted and shared information with the Western Shoshone groups listed in **Table 3.6-1** as part of Native American consultation process for the Proposed Action. The BLM used the following data collection methods for the identification of traditional sites and areas: on-site and off-site meetings and interviews with tribal officials and knowledgeable tribal members, review of the ethnographic report prepared for the proposed project, review of previous literature relevant to the current project area, and information on previously identified sites of traditional significance known by Elko District BLM staff.

Consultation, coordination, information sharing and communication with these groups included letters, phone calls, meetings, and at least five field visits (December 28, 2015; January 6 and 22 and August 19, 2016; June 15, 2017). During the ongoing consultation and information sharing, various tribes and bands have expressed concerns to the BLM about potential mining effects to TCPs and connections with the Tosawihi Quarries. The BLM continues to reach out and consult with the tribal communities on this project and seeks tribal input, shares information with, and updates interested tribes when appropriate and as requested by the tribes.

Tribal consultation, coordination and information sharing is an ongoing process that continues throughout the Section 106 and NEPA process for a project. **Table 3.6-1** provides a chronology of the most recent information sharing, consultation, and coordination activities that were initiated specifically for the Proposed Action and preparation of this EIS. The current efforts to obtain information on important places from the Western Shoshone groups are an extension of continued efforts from the past.

For the 1998 Rossi Mine PoO amendment to expand the mine site, the BLM initiated the request or invited the Western Shoshone tribes with an interest in the Rossi Mine area to conduct consultation, coordination and information sharing on the Rossi Mine Project. Efforts to provide information and in return obtain information or concerns from the Western Shoshone people at and around the Rossi Mine Project consisted of letters, telephone calls, meetings, and fieldtrips/site tours to the project. On May 29, 1997, the BLM hosted a fieldtrip to the Rossi Mine for the Shoshone-Paiute Tribe of the Duck Valley Indian Reservation, one member attended the fieldtrip. The Duck Valley representative video-taped the Rossi Mine site and visited some historic properties within the PoO boundary and surrounding area.

On June 4, 1997, the BLM invited the Te-Moak Tribe of Western Shoshone, the Shoshone-Paiute Tribes of the Duck Valley Indian Reservation, and the Western Shoshone Historic Preservation Society to enter into consultation for the 1998 Rossi Mine Expansion. The Battle Mountain Band, Elko Band, South Fork Band and Wells Band councils and Nevada Legal Services for the tribes were also included in the BLM's efforts to obtain information and knowledge from the Western Shoshone people about important or sacred areas in the vicinity of the Rossi Mine.

On July 1, 1997, the BLM hosted a field trip to the Rossi Mine. The attendees consisted of eight Western Shoshone people and their legal representatives. Six people were from the Battle Mountain Band and one person each from the Nevada Indian Environmental Council and Nevada Legal Services who were representing the Te-Moak Tribe of Western Shoshone attended the field trip. Several historic properties within the Rossi Mine PoO boundary and surrounding area were visited. Efforts were made to schedule other meetings and fieldtrips to the Rossi Mine, but people were not available to attend so the meetings and fieldtrips were cancelled. As a result of these efforts, the BLM did not receive any specific information to support the presence of important traditional cultural properties in the vicinity of the project area. (BLM 1998a).

In October 2009, the BLM initiated the request for consultation on the 2010 Rossi Mine expansion by hand delivering an informational package to the Shoshone-Paiute Tribes of the Duck Valley Indian Reservation, the Battle Mountain Band, and the Te-Moak Tribe of Western Shoshone. The Duckwater Shoshone Tribe, Elko Band Council, Ely Shoshone Tribe, Goshute Business Council, South Fork Band Council, Wells Band Council, Yomba Shoshone Tribe, Western Shoshone Committee, Western Shoshone Defense Council, Western Shoshone Defense Project, Western Shoshone Descendants of Big Smoky and the BIA Eastern Nevada Agency were also sent letters requesting information and invited to initiate consultation. Efforts to discuss the project and obtain information and consult on the 2010 Rossi Mine expansion consisted of telephone calls, letters, and the BLM managers attending tribal council meetings. As a result of these efforts, the BLM received either no response or responses such as: a response would be forthcoming, recommendations that the northern bands be contacted since they are more knowledgeable of the area, the topic has been placed on the tribal council meeting agenda, and more information is requested as to the relationship with the Tosawihi Quarries and Rock Creek TCPs. The BLM provided a map that illustrated the relationship of the Rossi Mine to the Tosawihi Quarries TCP that was designated at that time and the Rock Creek TCP. However, a letter from the Western Shoshone Committee that resides on the Duck Valley Indian Reservation notified the BLM that:

> *The proposed Rossi Mine Expansion Amendment to its current plan of operations lies within the aboriginal territory of the Western Shoshone people and that the project area is "culturally significant" within the meaning of the legal mandates that guide the treatment of such irreplaceable cultural resource. Because the Western Shoshone Committee is comprised of Western Shoshones who have used this area for various activities since time immemorial, the Committee and its individual members, meet the requirements for legal standing.*

Also included in this 2010 letter from the Western Shoshone Committee of Duck Valley was the statement, "families who originated from the area carry on cultural activities and religious practices in the surrounding area. The proposed amendment lies within areas that historically and modernly have been culturally significant to members of the Western Shoshone Committee. The cultural sites within the project area established that the Western Shoshone people commonly hunted, gathered, traded and practiced religious ceremonies within the project area in the past" (BLM 2010a). At this time, no specific or detailed information has been provided to the BLM regarding the specific locations of cultural sites, types of use or seasons/time of use for the area.

While the BLM was collecting information on past and contemporary tribal uses at the Tosawihi Quarries in August of 2014, some Western Shoshone people revealed for the first time to the BLM that important areas to them existed at or near the Rossi Mine. At this time, tribal members stated to the BLM that they had concerns that the Rossi and Arturo mines were moving toward Antelope Creek, and that the area was considered sacred. Their main concern was that the grave of Tso'apittseh, the stone giant or cannibal rocky giant that terrorized tribes throughout the region would be disturbed by the mining and exploration activities. According to Shoshone folklore, some believe this stone or rocky cannibal giant possessed evil spirits and an appetite for human flesh. The Western Shoshone believe that mining and exploration activities, such as drilling, blasting, earth movement and heavy equipment operations that cause vibration to the ground would disturb the grave site of Tso'apittseh and awaken him. Western Shoshone people informed the BLM that they are not willing to share all the information they hold important or sacred to them regarding the Rossi Mine and Tosawihi Quarries area, as they are considered too sacred to discuss with outsiders. During the preparation of the ethnography report and communications with the Western Shoshone for this project more specific information was provided to the

BLM that resulted in the development of four potential TCPs. On July 15, 2016, BLM personnel conducted a field meeting at or near the Rossi Mine to confirm potential TCP boundaries. **Table 3.6-1** provides a summary of the communications that have occurred between the BLM and the Western Shoshone people, including tribal councils and interested tribal members.

In January 2017, the BLM determined the legal boundaries of these historic properties and designated the four potential TCPs to be eligible for listing under the NRHP. The BLM provided their determination of eligibility to SHPO in January of 2017. SHPO had a thirty-five day review period under Section 106. SHPO concurred with the BLM in a letter dated February 23, 2017. Halliburton presented the proposed project to the Elko County Commissioners in 2013.

Table 3.6-1. Summary of Native American Consultation and Coordination for the Rossi Mine Expansion Project EIS

Name of Tribe/Band	Date of Communication	Summary of Communications
• Te-Moak Tribe of Western Shoshone • Battle Mountain Band Council • Elko Band Council • South Fork Band Council • Wells Band Council • Confederated Tribes of the Goshute Indian Reservation • Duckwater Shoshone Tribe • Ely Shoshone Tribe • Fort McDermitt Paiute-Shoshone Tribes of Nevada and Oregon • Shoshone-Bannock Tribes of the Fort Hall Indian Reservation • Shoshone-Paiute Tribes of the Duck Valley Indian Reservation • Timbisha Shoshone Tribe of Death Valley • Yomba Shoshone Tribe • Western Shoshone Committee • Western Shoshone Cultural Advisory Group • Western Shoshone Defense Project • Western Shoshone Descendants of Big Smoky • BIA: Eastern Nevada Agency	May 26, 2015	BLM sent a letter to the Chairperson for the tribes and bands and the contact for the interested Western Shoshone groups providing information on the Rossi Mine Expansion Project. The letter also stated an EIS will be prepared to analyze the effects of the project. The BLM requests to consult on a government-to-government basis. The BLM requested input, recommendations, concerns and advice on this project. The BLM also requested assistance in identifying locations within or adjacent to the project that may have religious, spiritual, traditional or cultural importance to the Western Shoshone people.
• Battle Mountain Band • South Fork Band	June 23, 2015	Two tribal members (one from each band) attended the Rossi Mine Expansion Project EIS kick-off meeting. There was some discussion about what resources are important and what the EIS should discuss. Also had some discussion regarding the ethnographic study.
• Te-Moak Tribe of the Western Shoshone • Battle Mountain Band Council • Elko Band Council • South Fork Band Council • Wells Band Council • Confederated Tribes of the Goshute Indian Reservation • Duckwater Shoshone Tribe • Ely Shoshone Tribe • Fort McDermitt Paiute Shoshone Tribe of	September 28, 2015	Dear Interested Party EIS scoping letter is sent to the Chairperson for each tribe and band and several individual Western Shoshone people, notifying them the BLM is preparing an EIS for the project and conducting scoping for the EIS.

Table 3.6-1. Summary of Native American Consultation and Coordination for the Rossi Mine Expansion Project EIS

Name of Tribe/Band	Date of Communication	Summary of Communications
Nevada and Oregon • Shoshone-Bannock Tribes of the Fort Hall Indian Reservation • Shoshone-Paiute Tribes of the Duck Valley Indian Reservation • Timbisha Shoshone Tribe of Death Valley • Yomba Shoshone Tribe • Western Shoshone Committee • Western Shoshone Cultural Advisory Group/Barrick • Western Shoshone Defense Council • Western Shoshone Defense Project • Western Shoshone Descendants of Big Smoky • BIA: Eastern Nevada Agency		
• Te-Moak Tribe of Western Shoshone • Battle Mountain Band Council • Elko Band Council • South Fork Band Council • Wells Band Council • Confederated Tribes of the Goshute Indian Reservation • Duckwater Shoshone Tribe • Ely Shoshone Tribe • Fort McDermitt Paiute Shoshone Tribe of Nevada and Oregon • Shoshone-Bannock Tribes of the Fort Hall Indian Reservation • Shoshone-Paiute Tribes of the Duck Valley Indian Reservation • Timbisha Shoshone Tribe of Death Valley • Yomba Shoshone Tribe • Western Shoshone Committee • Western Shoshone Cultural Advisory Group/Barrick • Western Shoshone Defense Council • Western Shoshone Defense Project • Western Shoshone Descendants of Big Smoky	October 15, 2015	The BLM sent a letter to the Chairperson of the tribes and bands and contact for interested Western Shoshone groups explaining that the BLM is preparing an EIS to analyze the Rossi Mine Expansion Project's potential effects. In preparation of the EIS, an ethnographic study will be conducted and the BLM requested assistance in obtaining information on areas of importance to the Western Shoshone people in the vicinity of the project.
• Battle Mountain Band Council • Battle Mountain Band legal counsel	October 30, 2015	The Battle Mountain Band Chairperson provided a letter via their legal counsel that described their scoping comments for the EIS during the scoping period for the project. Comments included the importance of conducting an ethnographic study to understand effects of the project on the Battle Mountain Band and comments on the potential effects of the project on natural and cultural resources. See comments in **Table 1-2**.

Table 3.6-1. Summary of Native American Consultation and Coordination for the Rossi Mine Expansion Project EIS

Name of Tribe/Band	Date of Communication	Summary of Communications
• Te-Moak Tribal Council • Battle Mountain Band Council • Battle Mountain Band legal counsel	November 12, 2015	The BLM met with the Chairperson for the Te-Moak Tribal Council and Battle Mountain Band Council along with the Battle Mountain Band's legal counsel. The Rossi Mine Expansion project was discussed, including scoping for the EIS and government-to-government consultation.
• Te-Moak Tribal Council	November 24, 2015	The BLM met with the new Te-Moak tribal council and provided information on the Rossi Mine Expansion Project. The BLM stated it is preparing an EIS. The BLM requested input and information to identify locations of religious, spiritual, traditional or cultural importance to the Western Shoshone people that may be affected by the project.
• Battle Mountain Band • Battle Mountain Band legal counsel • Elko Band • South Fork Band	December 28, 2015	Western Shoshone people, including elders, a council member and the Battle Mountain Band's legal counsel toured the Rossi Mine with HES and BLM personnel. HES' representative described the proposed project and existing operations. Information from the Western Shoshone attending this meeting is being incorporated into the ethnography report.
• Battle Mountain Band Council • Battle Mountain Band legal counsel • Elko Band • South Fork Band	January 6, 2016	Western Shoshone people, including elders, a council member and the Battle Mountain Band's legal counsel toured the Rossi Mine with HES and BLM representatives. HES' representative described the proposed project and the group toured the existing operations. The tour also included the ethnographers. After the mine tour the ethnographers met at the Battle Mountain Band office with the Western Shoshone people that attended the tour to discuss the fieldtrip and project. Information from this meeting was incorporated into the ethnography report.
• Battle Mountain Band Council	January 7, 2016	The BLM attends the Battle Mountain Band council meeting. Battle Mountain Band Chairperson told the BLM they would have to reschedule a meeting to discuss the Rossi Mine Expansion Project. Meeting is rescheduled for January 28, 2016.
• Battle Mountain Band Council	January 15, 2016	The BLM met with a few Battle Mountain Band council members in a short meeting and discussed the Rossi Mine Project. Meeting was scheduled to meet with the ethnographer and several elders, but due to weather the meeting with the ethnographers and elders was cancelled and rescheduled.
• Western Shoshone Committee	January 22, 2016	Information sharing meeting. The BLM met with Western Shoshone Committee members in the BLM office. The BLM provided information on the Rossi Mine Expansion Project to the members of the Western Shoshone Committee. Western Shoshone people of Duck Valley Indian Reservation would be meeting with the ethnographer for the project the last week of January 2016.

Table 3.6-1. Summary of Native American Consultation and Coordination for the Rossi Mine Expansion Project EIS

Name of Tribe/Band	Date of Communication	Summary of Communications
• Battle Mountain Band • Elko Band • South Fork Band	January 22, 2016	The BLM met with Western Shoshone people from the Battle Mountain Band, Elko Band, and South Fork Band toured and discussed the Rossi Mine Project and shared information for the ethnography report. HES' representative explained the proposed project. Ethnographers also attended this meeting and information from the meeting was incorporated into the ethnography report.
• Elko Band Council	January 27, 2016	The BLM attends the Elko Band council meeting. The BLM provided information to the Elko Band Council on the Rossi Mine Expansion Project, including the status of the ethnography report. The BLM is preparing a Memorandum of Agreement (MOA) regarding the treatment or data recovery of the affected the archeological resources located within the proposed project boundary. The Band would like to be involved in the MOA.
• Battle Mountain Band Council Meeting	January 28, 2016	The BLM scheduled to attend the Battle Mountain Band council meeting. The meeting is cancelled by the Battle Mountain Band. Meeting is to be rescheduled.
• Te-Moak Tribe of Western Shoshone • Battle Mountain Band Council • Elko Band Council • South Fork Band Council • Wells Band Council • Confederated Tribes of the Goshute Indian Reservation • Duckwater Shoshone Tribe • Ely Shoshone Tribe • Fort McDermitt Paiute Shoshone Tribe of Nevada and Oregon • Shoshone-Bannock Tribes of the Fort Hall Indian Reservation • Shoshone-Paiute Tribes of the Duck Valley Indian Reservation • Timbisha Shoshone Tribe of Death Valley • Yomba Shoshone Tribe • Western Shoshone Committee • Western Shoshone Cultural Advisory Group/Barrick • Western Shoshone Defense Council • Western Shoshone Defense Project • Western Shoshone Descendants of Big Smoky • BIA, Eastern Nevada Agency	February 2, 2016 February 3, 2016	The BLM sent a letter to the council for each of the tribes and bands and interested Western Shoshone groups providing an overview of the proposed project and the status of the NEPA process. This letter also informed the councils of each of the tribes and bands that an MOA is being prepared to address the treatment or data recovery of the affected archaeological resources within the project boundary.
• Shoshone-Paiute Tribes of the Duck Valley Indian Reservation	February 5, 2016	Ethnographers met with Western Shoshone people to discuss the Rossi Mine Project. Information from this meeting was included in the ethnography report.

Table 3.6-1. Summary of Native American Consultation and Coordination for the Rossi Mine Expansion Project EIS

Name of Tribe/Band	Date of Communication	Summary of Communications
• Duckwater Shoshone Tribe	February 18, 2016	A letter from the Chairman stated that their protocol is to defer the Rossi Mine Project to the Te-Moak Bands of the Western Shoshone for government-to-government consultation because the Rossi Mine Project is outside of the Duckwater Shoshone Tribe's boundaries of traditional use area. However, they wish to continue to be updated on the project.
• Western Shoshone Committee	December 2015, June to August 2016	Some elder Western Shoshone Committee members requested a field tour of the Rossi Mine when weather is nice to discuss the Rossi Mine Expansion Project proposal and visit the area in the summer months.
• Western Shoshone Committee	July 9, 2016	A Western Shoshone Committee member contacts the BLM to schedule field tour of the Rossi Mine that was requested by the elders in December 2015 and January 22, 2016.
• Battle Mountain Band	July 11, 2016	BLM personnel attended a field meeting with members of the Battle Mountain Band to discuss the potential TCPs at or near the Rossi Mine.
• Western Shoshone Committee	August 2, 2016	Western Shoshone Committee member representative responds to the BLM with a date of August 19, 2016, for field tour of the Rossi Mine.
• Western Shoshone Committee	August 4, 2016	The BLM confirms scheduled date of August 19, 2016 for field tour of the Rossi Mine with Western Shoshone Committee members.
• Te-Moak Tribe of Western Shoshone • Battle Mountain Band Council • Elko Band Council • South Fork Band Council • Wells Band Council • Confederated Tribes of the Goshute Indian Reservation • Duckwater Shoshone Tribe • Ely Shoshone Tribe • Fort McDermitt Paiute-Shoshone Tribes of Nevada and Oregon • Shoshone-Bannock Tribes of the Fort Hall Indian Reservation • Shoshone-Paiute Tribes of the Duck Valley Indian Reservation • Timbisha Shoshone Tribe of Death Valley • Yomba Shoshone Tribe • Western Shoshone Committee • Western Shoshone Cultural Advisory Group • Western Shoshone Defense Project • Western Shoshone Descendants of Big Smoky	August 9, 2016	The BLM notifies by email and invites approximately 50 Western Shoshone individuals, including the chairperson, tribal council and interested members of the tribes, bands, and groups that expressed an interest in attending a field tour of the Rossi Mine. These people were notified that the field tour is scheduled for August 19, 2016, to visit the Rossi Mine.

Table 3.6-1. Summary of Native American Consultation and Coordination for the Rossi Mine Expansion Project EIS

Name of Tribe/Band	Date of Communication	Summary of Communications
• Shoshone-Paiute Tribes of the Duck Valley Indian Reservation • Western Shoshone Committee • Great Basin Resource Watch	August 19, 2016	A field tour was held at the Rossi Mine as requested by some elders from the Shoshone-Paiute Tribe and the Western Shoshone Committee. Three Western Shoshone people from the Duck Valley Indian Reservation attended along with a representative and member from Great Basin Resource Watch that were invited by the Western Shoshone people to attend the trip. The group toured the mine site and the HES representative described the Proposed Action and existing operations. Discussions in the field included the relationship of the Tosawihi Quarries to the Rossi Mine site, mule deer migration, sage grouse habitat and seeps and springs in the vicinity of the mine site.
• Battle Mountain Band • Battle Mountain Band legal counsel	November 10, 2016	The BLM attended the tribal council meeting to discuss and provide a status update on the Rossi Mine EIS and the tentative potential TCP(s) in the vicinity of the Rossi Mine.
• Battle Mountain Band • Battle Mountain Band legal counsel	December 22, 2016	The BLM provides a draft memorandum and map for review and comment to the Battle Mountain Band Council and their legal counsel on the tentative determination of eligibility of four potential TCPs within the Rossi Mine proposed PoO boundary. The BLM provided the Band with a 15 day comment period; comments are due by January 6, 2017 to BLM.
• Battle Mountain Band legal counsel	December 30, 2016	Battle Mountain Band legal counsel provides the BLM with comments on the potential TCP at the Rossi Mine. Memo and map appear to accurately reflect the information shared by the Band. The Band supports the finding for the TCP's eligible for the NRHP.
• Te-Moak Tribe of Western Shoshone • Battle Mountain Band Council • Elko Band Council • South Fork Band Council • Wells Band Council • Confederated Tribes of the Goshute Indian Reservation • Duckwater Shoshone Tribe • Ely Shoshone Tribe • Fort McDermitt Paiute Shoshone Tribe of Nevada and Oregon • Shoshone-Bannock Tribes of the Fort Hall Indian Reservation • Shoshone-Paiute Tribes of the Duck Valley Indian Reservation • Timbisha Shoshone Tribe of Death Valley • Yomba Shoshone Tribe	March 29, 2017	The BLM sends a letter to the Chairperson for each of the tribes and bands inviting them to participate in government-to-government consultation on the preliminary determination of effects from this project to the cultural resources that have been determined eligible to the NRHP. This letter also informs the tribes and bands of the results for the cultural resource inventories completed for the expansion project.

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Name of Tribe/Band	Date of Communication	Summary of Communications
• Duckwater Shoshone Tribe	April 25, 2017	Duckwater Shoshone Tribe Chairman responds with a letter thanking the BLM for the invitation to participate in government-to-government consultation on the preliminary determination of effects from this project to the cultural resources that have been determined eligible to the NRHP. The letter notes that the mine location is out of the traditional boundaries of the Duckwater Shoshone Tribe and that the tribe defers the project to the Te-Moak Tribe of Western Shoshone.
• Battle Mountain Band Council	April 25, 2017	The BLM attended the tribal council meeting. The Rossi Mine Project status was discussed at this meeting.
• Battle Mountain Band Council	April 27, 2017	The BLM received a letter from the Battle Mountain Band Chairperson regarding consultation on the proposed Rossi Mine Expansion Project. The letter stated the Battle Mountain Band's concerns about the impacts of the Rossi Mine and its proposed expansion project on archaeological and cultural resources and TCPs that are a part of the Tosawihi Quarries.
• South Fork Band Council	May 5, 2017	The BLM received a letter from the South Fork Band Chairman accepting BLM's March 29, 2017, invitation for consultation on the Rossi Mine Expansion Project. The letter further states "This extends from the inception of the project through its completion. The letter notes that the proposed area is traditional Shoshone Homeland and in an extremely culturally sensitive area. The South Fork Band believes it's of vital importance to remain up to date and be involved in the development of the project. The letter states that the potential for adverse impacts to locations sacred to the South Fork Band is high and that the only way to partially alleviate that threat is to be active in the planning process. The South Fork Band requested an update of upcoming meetings or proceedings related to the project."

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Name of Tribe/Band	Date of Communication	Summary of Communications
• Te-Moak Tribe of Western Shoshone • Battle Mountain Band Council • Elko Band Council • South Fork Band Council • Wells Band Council • Confederated Tribes of the Goshute Indian Reservation • Ely Shoshone Tribe • Fort McDermitt Paiute Shoshone Tribe of Nevada and Oregon • Shoshone-Bannock Tribes of the Fort Hall Indian Reservation • Shoshone-Paiute Tribes of the Duck Valley Indian Reservation • Timbisha Shoshone Tribe of Death Valley • Yomba Shoshone Tribe	May 15 through 22, 2017	The BLM made phone calls to each of the tribes to discuss whether or not they are interested in consulting with the BLM on the March 29, 2017, letter regarding the preliminary determination of effects to the archaeological sites and the TCPs within the Rossi Mine Expansion Project PoO boundary. Messages were left as the Chairperson's were not available.
• Te-Moak Tribe of Western Shoshone	May 24, 2017	The BLM sent an email to the Chairperson seeking comments and questions regarding the March 29, 2017, letter regarding the preliminary determination of effects to historic properties for the proposed Rossi Mine expansion project. The March 29, 2017, letter was attached to the email. The Tribe received the March 29th letter on March 31, 2017, and the BLM attempted to contact the Chairperson by phone on May 15, 17, and 22, 2017. The BLM invited the Chairperson to schedule a meeting or conference call on either June 12, 15 or 16, 2017. The BLM notified the Chairperson that at close of business on June 16, 2017, the BLM would conclude consultation efforts.
• Battle Mountain Band Council	May 24, 2017	The BLM sent an email to the Chairperson seeking comments and questions regarding the March 29, 2017, letter regarding the preliminary determination of effects to historic properties for the proposed Rossi Mine expansion project. The March 29, 2017, letter was attached to the email. The Band received the March 29th letter on April 3, 2017, and the BLM attempted to contact the Chairperson by phone on May 15, 17 and 22, 2017. The BLM invited the Chairperson to schedule a meeting or conference call on either June 12, 15 or 16, 2017. The BLM notified the Chairperson that at close of business on June 16, 2017, the BLM would conclude consultation efforts. The Battle Mountain Band legal counsel responded to BLM, he will schedule continue consultation calls or meetings.
• Elko Band Council	May 24, 2017	The BLM sent an email to the Chairman seeking comments and questions regarding the March 29, 2017, letter regarding the preliminary determination of effects to historic properties for the proposed Rossi Mine expansion project. The March 29, 2017, letter was attached to the email. The Band received the March 29th letter on March 31, 2017,

Table 3.6-1. Summary of Native American Consultation and Coordination for the Rossi Mine Expansion Project EIS

Name of Tribe/Band	Date of Communication	Summary of Communications
		and the BLM attempted to contact the Chairman by phone on May 15, 2017. The BLM invited the Chairman to schedule a meeting or conference call on either June 12, 15 or 16, 2017. The BLM notified the Chairman that at close of business on June 16, 2017, the BLM would conclude consultation efforts.
• South Fork Band Council	May 24, 2107	The BLM sent an email to the Chairman seeking comments and questions regarding the March 29, 2017, letter regarding the preliminary determination of effects to historic properties for the proposed Rossi Mine expansion project. The March 29, 2017, letter was attached to the email. The Band received the March 29th letter on March 31, 2017, and the BLM attempted to contact the Chairman by phone on May 22, 2017. The BLM confirmed receiving the Chairman's letter dated May 5, 2017. The BLM invited the Chairman to schedule a meeting or conference call on either June 12, 15 or 16, 2017. The BLM notified the Chairman that at close of business on June 16, 2017, the BLM would conclude consultation efforts.
• Wells Band Council	May 24, 2017	The BLM sent an email to the Chairman seeking comments and questions regarding the March 29, 2017, letter regarding the preliminary determination of effects to historic properties for the proposed Rossi Mine expansion project. The March 29, 2017, letter was attached to the email. The Band received the March 29th letter on April 3, 2017, and the BLM attempted to contact the Chairman by phone on May 17, 2017. The BLM invited the Chairman to schedule a meeting or conference call on either June 12, 15 or 16, 2017. The BLM notified the Chairman that at close of business on June 16, 2017, the BLM would conclude consultation efforts.
• Confederated Tribes of the Goshute Indian Reservation	May 24, 2017	The BLM sent an email to the Chairman seeking comments and questions regarding the March 29, 2017, letter regarding the preliminary determination of effects to historic properties for the proposed Rossi Mine expansion project. The March 29, 2017, letter was attached to the email. The tribe received the March 29th letter on April 4, 2017 and the BLM attempted to contact the Chairman by phone on May 15, 2017. The BLM invited the Chairman to schedule a meeting or conference call on either June 12, 15 or 16, 2017. The BLM notified the Chairman that at close of business on June 16, 2017, the BLM would conclude consultation efforts.
• Ely Shoshone Tribe	May 24, 2017	The BLM sent an email to the Chairman seeking comments and questions regarding the March 29, 2017, letter regarding the preliminary determination of effects to historic properties for the proposed

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Name of Tribe/Band	Date of Communication	Summary of Communications
		Rossi Mine expansion project. The March 29, 2017, letter was attached to the email. The tribe received the March 29th letter on April 3, 2017 and the BLM attempted to contact the Chairman by phone on May 17, 2017. The BLM invited the Chairman to schedule a meeting or conference call on either June 12, 15 or 16, 2017. The BLM notified the Chairman that at close of business on June 16, 2017, the BLM would conclude consultation efforts.
• Fort McDermitt Paiute Shoshone Tribe of Nevada and Oregon	May 24, 2017	The BLM sent an email to the Chairman seeking comments and questions regarding the March 29, 2017, letter regarding the preliminary determination of effects to historic properties for the proposed Rossi Mine expansion project. The March 29, 2017, letter was attached to the email. The tribe received the March 29th letter on April 10, 2017, and the BLM attempted to contact the Chairman by phone on May 15, 2017. The BLM invited the Chairman to schedule a meeting or conference call on either June 12, 15 or 16. The BLM notified the Chairman that at close of business on June 16, 2017, the BLM would conclude consultation efforts.
• Shoshone-Bannock Tribes of the Fort Hall Indian Reservation	May 24, 2017	The BLM sent an email to the Chairman seeking comments and questions regarding the March 29, 2017, letter regarding the preliminary determination of effects to historic properties for the proposed Rossi Mine expansion project. The March 29, 2017, letter was attached to the email. The tribe received the March 29th letter on April 3, 2017 and the BLM attempted to contact the Chairman by phone on May 15 and 17, 2017. The BLM invited the Chairman to schedule a meeting or conference call on either June 12, 15 or 16. The BLM notified the Chairman that at close of business on June 16, 2017, the BLM would conclude consultation efforts.
• Shoshone-Paiute Tribes of the Duck Valley Indian Reservation	May 24, 2017	The BLM sent an email to the Chairman seeking comments and questions regarding the March 29, 2017, letter regarding the preliminary determination of effects to historic properties for the proposed Rossi Mine expansion project. The March 29, 2017, letter was attached to the email. The tribe received the March 29th letter on April 3, 2017 and the BLM attempted to contact the Chairman by phone on May 17 and May 24, 2017. The BLM invited the Chairman to schedule a meeting or conference call on either June 12, 15 or 16. The BLM notified the Chairman that at close of business on June 16, 2017, the BLM would conclude consultation efforts.
• Timbisha Shoshone Tribe of Death Valley	May 24, 2017	The BLM sent an email to the Chairman seeking comments and questions regarding the March 29, 2017, letter regarding the preliminary determination of effects to historic properties for the proposed

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Name of Tribe/Band	Date of Communication	Summary of Communications
		Rossi Mine expansion project. The March 29, 2017, letter was attached to the email. The tribe received the March 29th letter on April 10, 2017 and the BLM attempted to contact the Chairman by phone on May 17 and May 22, 2017. The BLM invited the Chairman to schedule a meeting or conference call on either June 12, 15 or 16. The BLM notified the Chairman that at close of business on June 16, 2017, the BLM would conclude consultation efforts.
• Yomba Shoshone Tribe	May 24, 2017	The BLM sent an email to the Chairman seeking comments and questions regarding the March 29, 2017, letter regarding the preliminary determination of effects to historic properties for the proposed Rossi Mine expansion project. The March 29, 2017, letter was attached to the email. The tribe received the March 29th letter on April 4, 2017 and the BLM attempted to contact the Chairman by phone on May 15, 2017. The BLM invited the Chairman to schedule a meeting or conference call on either June 12, 15 or 16. The BLM notified the Chairman that at close of business on June 16, 2017, the BLM would conclude consultation efforts.
• Wells Band Council	May 26, 2017	The BLM received an email from the Wells Band's assistant to the Chairman. The email stated the information was distributed to the tribal council members. If there are any questions, concerns, or need for consultation they will contact the BLM.
• Fort McDermitt Paiute Shoshone Tribe of Nevada and Oregon (FMPST)	May 31, 2017	The BLM received an email from the Chairman in response to the BLM's May 24, 2017 email. The email from the Chairman states FMPST has no opposition with the Tuscarora Expansion Project, there may be historic burial sites but many of our Shoshone tribal members have been placed on reservations throughout the western states, without knowledge of their historical properties.
• Battle Mountain Band legal counsel	May 31, 2017	The Battle Mountain Band's legal counsel sent an email to the BLM with a request to schedule a fieldtrip to the Rossi Mine site on June 15, 2017. Through various emails all the parties agree on the date of June 15, 2017 for a fieldtrip to the Rossi Mine.
• Shoshone-Paiute Tribes of the Duck Valley Indian Reservation	June 1, 2017	The BLM received an email from the Chairman that states the Shoshone-Paiute Tribes do not recognize letters, phone calls or emails as consultation. Government-to-government consultation and how it's to be carried out is an issue that needs to be clarified with the Nevada BLM.
• Confederated Tribes of the Goshute Indian Reservation	June 2, 2017	Automated voice messaging system so the BLM left a message for the Chairman. Message asked if he would like to schedule a conference call meeting to discuss the March 29, 2017, letter regarding the preliminary determination of effects

Table 3.6-1. Summary of Native American Consultation and Coordination for the Rossi Mine Expansion Project EIS

Name of Tribe/Band	Date of Communication	Summary of Communications
		on historic properties at the Rossi Mine. Message also stated the BLM manager is available on June 12 or 16 for a meeting.
• Ely Shoshone Tribe	June 2, 2017	The BLM called to speak to the Chairman and after explaining to the person who answered the phone why the BLM was calling; he asked that the BLM call back on Monday when someone would be available to help.
• Shoshone-Bannock Tribes of the Fort Hall Indian Reservation	June 2, 2017	The BLM called and spoke to the receptionist. Acting Chairman was not available. She asked that the May 24, 2017, email be resent to the Chairman's assistant. The BLM resent the May 24, 2017, email including a statement that the BLM manager is available for a conference call meeting on June 12 and 16.
• Timbisha Shoshone Tribe of Death Valley	June 2, 2017	The BLM called and spoke to the receptionist. Chairman was not available. Left a message stating the BLM would like to schedule a meeting to discuss the March 29, 2017, letter regarding the preliminary determination of effects on historic properties at the Rossi Mine. Message also stated the BLM manager is available for a conference call meeting on June 12 and 16.
• Yomba Shoshone Tribe	June 2, 2017	Automated voice messaging system so the BLM left a message for the Chairman. Message asked if he would like to schedule a conference call meeting to discuss the March 29, 2017, letter regarding the preliminary determination of effects on historic properties at the Rossi Mine. Message also stated the BLM manager is available on June 12 or 16 for a meeting.
• Te-Moak Tribe of Western Shoshone • Battle Mountain Band Council • Elko Band Council • South Fork Band Council • Wells Band Council • Shoshone-Paiute Tribes of the Duck Valley Indian Reservation	June 2, 2017	The BLM sent an email invitation to each of these tribes and bands inviting them on a fieldtrip to the Rossi Mine to discuss the preliminary determination of effects that the proposed mine would have on the TCPs and the archaeological sites. Several figures were attached to the email with information on the archaeological sites and TCPs.
• Confederated Tribes of the Goshute Indian Reservation	June 5, 2017	The BLM phoned the tribe and spoke to the receptionist. Chairman is unavailable. Receptionist recommended resending the May 24, 2017, email. The BLM resent the May 24, 2017, email to the chairman and included a statement regarding scheduling a telephone conference call on either June 12 or 16 to discuss the March 29, 2017 letter.
• Te-Moak Tribe of Western Shoshone	June 9, 2017	The BLM phoned the Chairperson to remind her of the fieldtrip scheduled for June 15, 2017 to the Rossi Mine. Email invitation was sent on June 2, 2017. Message was left on voice mail.

Table 3.6-1. Summary of Native American Consultation and Coordination for the Rossi Mine Expansion Project EIS

Name of Tribe/Band	Date of Communication	Summary of Communications
• Elko Band Council	June 9, 2017	The BLM phoned the Band in an attempt to speak to the Chairman to schedule a meeting regarding the March 29, 2017, letter and remind the Chairman of the fieldtrip on June 15, 2017 to the Rossi Mine. The receptionist stated the Chairman was not available. Asked to leave a message with the receptionist instead she transferred the call to the Chairman's voice mail. It was full and would not receive any further messages.
• South Fork Band Council	June 9, 2017	The BLM phoned the Band in an attempt to contact the Chairman. The BLM left a voice mail message reminding the Chairman that an email invitation was sent on June 2, 2017, for a fieldtrip to the Rossi Mine scheduled for June 15, 2017.
• Wells Band Council	June 9, 2017	The BLM phoned the Band in an attempt to contact the Chairman. The BLM left a voice mail message reminding the Chairman that an email invitation was sent on June 2, 2017, for a fieldtrip to the Rossi Mine scheduled for June 15, 2017.
• Confederated Tribes of the Goshute Indian Reservation	June 9, 2017	The BLM called the Chairman to schedule a conference call meeting for June 12 or 16, 2017, to discuss the March 29, 2017, letter regarding the preliminary determination of effects letter for the cultural resources involved in the Rossi Mine Expansion Project. A phone conference call was scheduled for June 16, 2017. Per request from the Chairman, the BLM resent the email message from May 24, 2017, containing the March 29, 2017 letter.
• Ely Shoshone Tribe	June 9, 2017	The BLM calls the Chairman to schedule a conference call meeting for June 12 or 16, 2017, to discuss the March 29, 2017, preliminary determination of effects letter for the cultural resources involved in the Rossi Mine Expansion Project. Scheduled a conference call meeting with the Chairman to discuss the Rossi Mine Expansion Project on June 12, 2017. Per request, the BLM resent the email containing the March 29, 2017, letter.
• Shoshone-Bannock Tribes of the Fort Hall Indian Reservation	June 9, 2017	The BLM called the Tribes in an attempt to contact the Chairman to schedule a conference call meeting for either June 12 or 16, 2017, to discuss the March 29, 2017, preliminary determination of effects letter for the cultural resources involved in the Rossi Mine Expansion Project. The receptionist directs the BLM to an assistant to the Chairman, who is not available and the person's voice mail box is full and would not except messages. The BLM resent the May 24, 2017, email.

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Name of Tribe/Band	Date of Communication	Summary of Communications
• Shoshone-Paiute Tribes of the Duck Valley Indian Reservation	June 9, 2017	The BLM called the Shoshone-Paiutes Tribes in an attempt to speak with the Chairman. The Chairman is unavailable. The BLM left a message with the receptionist that an email was sent on June 2, 2017, inviting the Chairman and others on a fieldtrip to the Rossi Mine on June 15, 2017.
• Timbisha Shoshone Tribe of Death Valley	June 9, 2017	The BLM called the Chairman to schedule a conference call meeting for June 12 or 16, 2017, to discuss the March 29, 2017, preliminary determination of effects letter for the cultural resources involved in the Rossi Mine Expansion Project. The Chairman asked the BLM to contact their Tribal Historic Preservation Officer (THPO) and discuss the letter with the THPO. The BLM sent an email to the THPO to make contact and schedule a conference call to discuss the March 29, 2017 letter. A call was scheduled for June 12, 2017.
• Yomba Shoshone Tribe	June 9, 2017	The BLM called the Chairman to schedule a conference call meeting for June 12 or 16, 2017, to discuss the March 29, 2017, preliminary determination of effects letter for the cultural resources involved in the Rossi Mine Expansion Project. No contact; a message was left on voice mail.
• Ely Shoshone Tribe	June 12, 2017	The BLM phoned the Chairman to conduct a conference call meeting to discuss the March 29, 2017, letter regarding the preliminary determination of effects for the cultural resources involved in the Rossi Mine Expansion Project. The Chairman was still in a meeting. The BLM left a message with the tribal coordinator. The BLM manager later received a phone message from the tribal coordinator that stated "The tribal council reviewed and discussed the Rossi Mine letter. They have no comments. They were fine with the letter."
• Timbisha Shoshone Tribe of Death Valley	June 12, 2017	The BLM phoned the THPO. The THPO stated the project was outside of their territory although they are Shoshone. They will refer the information for the project to the local tribes that are directly affected by the project. The THPO will meet with the council tomorrow and they will discuss the letter. If the council has a different opinion then she will contact BLM, but she doesn't expect the elders to have a different opinion and expects them to defer to the local tribes.

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Name of Tribe/Band	Date of Communication	Summary of Communications
• Te-Moak Tribe of Western Shoshone • Battle Mountain Band Council • South Fork Band Council • Battle Mountain Band legal counsel	June 15, 2017	Representatives from the BLM, HES, tribal members from the Battle Mountain Band and South Fork Band and the Battle Mountain legal counsel attend fieldtrip to the Rossi Mine. At the mine site information was shared, questions were asked, and issues of concern and elements of the project were discussed. The tribal representatives expressed concern that the mine site be reclaimed; therefore, concurrent and final reclamation of the mine were the main points of discussion.
• Confederated Tribes of the Goshute Indian Reservation	June 16, 2017	The BLM phoned the Chairman. After introducing and describing some of the project and details of the historic properties. The Chairman asked for clarification of the location of the project. The BLM explained the location of the project. The Chairman stated the project is outside their area of consultation. He referred the BLM to contact the tribes and bands around Elko and Battle Mountain, Nevada.
• Battle Mountain Band Council	July 5, 2017	The Battle Mountain Band Chairperson sends a letter to the BLM. The letter requests tribal monitors be on site during data recovery of archaeological sites. When drilling in areas of concern to the Band, they would like monitors on site. They also requested the curation of any cultural materials (non-burial) collected during data recovery be housed at their museum on the reservation in Battle Mountain.
• Battle Mountain Band Council	July 12, 2017	The BLM meets with the Chairperson and a tribal council member. The BLM acknowledges receipt of the July 5, 2017, letter from the Band. The Chairperson, tribal council member and BLM discuss the letter. The Band would like to be able to keep the cultural material (non-burial) from the data recovery of archaeological sites in their museum on the Battle Mountain Band Reservation. Everyone at this meeting agreed this item needs further discussion. The BLM informed the Chairperson and council member that they will issue a final determination of effects letter for the TCP's and archaeological sites. The status of the EIS process was also discussed.
• Te-Moak Tribe of Western Shoshone • Battle Mountain Band Council • Elko Band Council • South Fork Band Council • Wells Band Council • Confederated Tribes of the Goshute Indian Reservation • Ely Shoshone Tribe • Fort McDermitt Paiute Shoshone Tribe of Nevada and Oregon • Shoshone-Bannock Tribes of the Fort Hall	September 12, 2017	BLM mailed each of the tribes and bands Chairperson a letter describing the final determination of effects for the TCP's and the eligible archaeological sites. This letter was also mailed to the Nevada SHPO.

Table 3.6-1. Summary of Native American Consultation and Coordination for the Rossi Mine Expansion Project EIS

Name of Tribe/Band	Date of Communication	Summary of Communications
Indian Reservation • Shoshone-Paiute Tribes of the Duck Valley Indian Reservation • Timbisha Shoshone Tribe of Death Valley • Yomba Shoshone Tribe		
• Te-Moak Tribe of Western Shoshone • Battle Mountain Band Council • Elko Band Council • South Fork Band Council • Wells Band Council • Confederated Tribes of the Goshute Indian Reservation • Ely Shoshone Tribe • Fort McDermitt Paiute Shoshone Tribe of Nevada and Oregon • Shoshone-Bannock Tribes of the Fort Hall Indian Reservation • Shoshone-Paiute Tribes of the Duck Valley Indian Reservation • Timbisha Shoshone Tribe of Death Valley • Yomba Shoshone Tribe	September 18, 2017	The Nevada SHPO and the tribes and bands received the final determination of effects letter from the BLM for the cultural resources involved in the Rossi Mine Expansion Project. Letter provides for a 30 day comment period.
• Te-Moak Tribe of Western Shoshone • Battle Mountain Band Council • Elko Band Council • South Fork Band Council • Wells Band Council • Confederated Tribes of the Goshute Indian Reservation • Ely Shoshone Tribe • Fort McDermitt Paiute Shoshone Tribe of Nevada and Oregon • Shoshone-Bannock Tribes of the Fort Hall Indian Reservation • Shoshone-Paiute Tribes of the Duck Valley Indian Reservation • Timbisha Shoshone Tribe of Death Valley	October 17, 2017	The BLM receives concurrence from the Nevada SHPO on the final determination of effects letter dated September 12, 2017, for the Rossi Mine Expansion Project. The BLM did not receive a response from any of the tribes or bands regarding this letter.

3.6.1.3 Ethnographic Context

As part of the tribal coordination, communication, and consultation efforts, an ethnographic report was prepared for the Rossi Mine Project; public information from that report is presented in this section (McBride and Tiley 2016). The purpose of the ethnographic report was to summarize Native American concerns regarding the proposed project and to update existing ethnographic information on Western Shoshone traditional use of the study area. The BLM's efforts to reach out to the tribal communities for the ethnography elicited a response from the Battle Mountain Band, Elko Band, and the South Fork Band of the Te-Moak Tribe of Western Shoshone Indians of Nevada. The Shoshone-Paiute Tribes of the Duck Valley Reservation also participated. Elders, council members, and tribal members toured the Rossi Mine and provided information to the ethnographers for this report. Previous ethnographic documentation

available online, at the BLM, and at state repositories was reviewed to develop the ethnographic overview of the area. Additionally, consultation between tribal governments and the BLM conducted for previous mining activities in and near the study area was examined to provide a reference point for current tribal concerns. In order to update previous ethnographic documentation and to solicit concerns relative to the currently proposed project, the ethnographers met with tribal individuals, attended tribal meetings, and participated in field visits to the study area.

The Western Shoshone are the indigenous or aboriginal people of the area including most of Northern Nevada, and specifically the study area. The Western Shoshone refer to themselves as “Newe,” which translates to “the people” (Bengston 2003). Their hunter-gatherer ancestors occupied a vast territory in autonomous, highly mobile groups associated with specific home districts, united by a common language and culture.

White Knife Shoshones

The Western Shoshone group most closely associated with the Rossi Mine project area is the White Knife or Tosawihi Shoshone. They are relatively well-documented in the ethnographic, historical, and cultural research management literatures. The following overview is meant to briefly describe the culture in the proto-historic and historic past, and link this to current groups and the concerns they have regarding the development of what they now call the “Tosawihi Homeland.” Incorporating previously compiled material, this overview has been expanded to include public information gathered from recent studies in the area.

The following review is focused on northernmost Nevada, in order to encompass the study area. Much of the material on the project vicinity is focused upon nearby Tosawihi Quarries, and much of the use of the project area is related to its nearness. The Tosawihi Quarries Archaeological District or area is located approximately eight to nine air miles or eleven road miles northwest of the Rossi Mine project area (distances were calculated using Google Earth Pro).

Territory

The Western Shoshone traditionally inhabited an area comprising the eastern and southern half of present-day Nevada.

Thomas, Pendleton, and Cappannari (1986:262) stated:

> *Western Shoshone country extended from the arid reaches of Death Valley inhabited by the Panamint Shoshone, through the mountainous highlands of central Nevada into northwestern Utah, where it encompassed the area of the Gosiute of Tooele and Skull valleys and Deep Creek and the ‘Weber Ute.’ The northern boundary is rather arbitrarily taken as roughly the divide separating the Humboldt River drainage from the Snake and Salmon River area, where the Northern Shoshone lived; the people of the Duck Valley Reservation are also included.*

Steward (1938:162) restricted the designation Tosawihi to people who wintered on the Humboldt River above Battle Mountain, and disagreed with those who felt this was a band with a considerably larger range. He included the Rock Creek area as their hunting and gathering area. Many contemporary observers, however, disagreed. Hurt (1856:228-9) was similarly restrictive, applying the term only to a group living near Stony Point, while Powell and Ingalls (1874:12) used it for people in the Battle Mountain vicinity. Holeman (1852:52) included people of the Humboldt River and Goose Creek Mountains, and Burton (1862:481) extended the term even to the people of Diamond Valley. Simpson (1876:34-35) used the term most broadly, as he considered the “To-sa-witches” to be a division of Shoshones along the Humboldt River between the Un-goew-ah and Cooper’s Ranges.

Rusco and Raven (1992:9-10) and Rusco (1993) reviewed the ethnohistoric information on the Tosawihi or White Knife Shoshone (see especially Steward 1938, 1940 and Harris 1940), placing the pre-contact range “in the Humboldt River Valley around Battle Mountain, the lands drained by Rock Creek and other northern tributaries of the Humboldt as far west as Golconda or Winnemucca and east to the Independence Mountains”. The summer range extended north to the Owyhee and Snake rivers and south to Austin and Eureka (Harris 1940:39).

The population in the Humboldt River area was comparatively high, and this was reflected in the accounts of early observers. Ogden visited a village of 150 “tents” while he was in the Humboldt area, and was visited by 150 Indians (Steward 1938:154). Holeman reported two groups of Humboldt River Shoshone in 1853, which he reported to be under the leadership of Ne-me-te-kah (“man eater”). They were broken into two groups; one group of 200 was near the current Wells, Nevada, with 450 at Stony Point (Valmy) under the leadership of a sub-chief near Battle Mountain in 1858 (Forney 1858). In 1859, Forney reported seven bands along the Humboldt River (1859:363). These numbers are not improbably high when one considers reports of 1,000 Shoshone people camped at the South Fork near Elko (Steward 1938:155).

Subsistence and Settlement

The Tosawihi Shoshones had a large range with varied resources which they visited seasonally. The Humboldt River provided riverine resources and wetlands; Steward calls the area “fertile” compared to other Western Shoshone tracts (1938:153). They often wintered (and sometimes summered) on the Snake River in order to fish, and spent the fall in the Ruby Mountains or the Reese Valley for pine-nutting (Clemmer 2009b:561). These movements, at least those observed in the historic period, were not by individuals, but rather as an *en masse* movement of the group (Clemmer 1990:2). The quarries were visited in transit, accessed from camps in the better watered and sheltered drainages such as Boulder Valley.

Winter encampments were set up in places where “accessibility to stored seeds, especially pine nuts, water, sufficient wood for house building and fuel, and absence of extremely low winter temperatures” (Steward 1938:232). These conditions were most often met in the pinyon-juniper belt of the mountains, at canyon mouths, or in broad valleys near fishing streams. Boulder Creek, with its broad braided channels on its lower courses, and riparian strip along its upper reaches, would have met these requirements in several locations. The nearness to the wetlands along the Humboldt, a kind of economic focus routinely overlooked by Steward, would have also enhanced its attractiveness.

Winter houses were conical, bark-covered structures, with a single ring of stones to stabilize the vertical supports (Thomas, Pendleton, and Cappannari 1986:268). Temporary dwellings away from winter encampments sometimes included gabled houses, but may have been as casual as windbreaks and sunshades or rockshelters or caves (Thomas, Pendleton, and Cappannari 1986). Ancillary structures included pine nut caches and conical sweat lodges (Driver 1937; Steward 1940, 1941).

The Western Shoshone travelled extensively, and the Boulder Creek drainage was a natural route. People from the Tosawihi area travelled south to the Humboldt River to fish, and even further south of Beowawe to gather pine nuts. Boulder Creek used to drain into Rock Creek, which drained into the Humboldt, and in former times there were wetlands that stretched all the way to Valmy. Willie Harney said that fish used to spawn all the way up Boulder Creek. The Boulder Creek area also was along the travel path north to the Snake River (Tiley 2012).

The seasonally important Snake River fishery fostered extensive ties between groups. Another Western Shoshone group, the Bruneau, also fished there, and the catch was shared with the Bannocks and the Koa’agai’itoka (Murphy and Murphy 1986:287; Steward 1939:133). When the salmon were abundant there, people from both the Snake and Humboldt Rivers also wintered on the South Fork of the Owyhee River at a location called *Sohohunub* (Steward 1938:168). The spring fish run attracted people to the smaller drainages for fishing and for collecting roots and berries (Clemmer 2009c:402). Fish weirs were constructed on the larger rivers, while basketry traps were employed on smaller streams (Murphy and Murphy 1986:222,225).

Rabbit drives conducted in the fall and winter provided meat and furs. Rabbits were driven into long nets by the entire community led by a “rabbit boss”. A favored spot was *Pagawi*, at Rock House. Steward noted that sometimes several small communities joined together for these drives. Another communal activity was antelope hunting (Clemmer 2009b:568-569). Steward relayed that he was told that people at Battle Mountain hunted antelope under the Paiute antelope shaman near Iron Point (1938:163). Cooperative deer hunts were also sometimes held.

Away from the rivers, there is evidence that the Western Shoshone used fire to enhance seed production, and to drive crickets, grasshoppers, rabbits, deer, and antelope (Stewart 2002:227-31; Steward

1938:118-119). Hunting was pursued in the northern Nevada Tosawihi territory, especially in areas adjacent to Willow Creek, well into the 20th century.

Steward obtained details on only four winter settlements. The first was along the Humboldt River between Battle Mountain and Iron Point, although this was less a formal settlement than a general area to which people returned. Another was named *Pagowe*, about two miles east of Herron on the river. *Bohowia*, near Iron Point, was a place where about ten families wintered. Finally, there was a concentration of camps near Battle Mountain named *Tonomudza* (Steward 1938:162).

Although Steward and others characterize the Western Shoshone as a whole as living in an austere environment in which they could barely eke out a living, there has been recent critical scrutiny of that assertion by Clemmer (2009c) and others. Particularly in the case of the Tosawihi, whose territory included extensive wetlands, a salmon fishery, broad seed-filled valleys, and access to mountains for pine nuts and game, the impoverished conditions reported by historic observers were likely to have been the consequence of historic disruptions.

Social Organization

The protohistoric social organization of the White Knife Shoshones is the topic of current debate. While this group was often identified in the historic record, Steward dismisses the notion that the White Knives were a band:

> *...The much publicized Tosawi or White Knife people of the Battle Mountain region are so called because an excellent grade of white chert is found in that country...They had no organization and were not a band. People who wintered on the Humboldt River above Battle Mountain were called Tosawi (tosa, white, and wi, knife) because they procured...white flint for knives in the mountains to the north. This name, unfortunately, became prominent and led to the fiction that all Shoshoni in a large area around Battle Mountain had comprised a band by this name. Because, like other Shoshoni group names, Tosawi did not designate a definitely bounded linguistic, political, cultural, or even geographical division, no two writers have agreed on its use (Steward 1938:248,162).*

Harris (1940:39) paints much the same picture, stating that the name "White Knives" was geographical in nature, "designating a shifting membership of Indians who were also known by a number of other names depending upon their temporary location or their principal food supply". Harris did, however, discuss the Tosawihi group as a separate entity in his study.

Clemmer (1990:2, 2009c), on the other hand is convinced that the White Knives were, in fact, a group which he defines as an *ethnie*; a self-identified group of people with shared cultural characteristics distinguishing themselves from others and sharing ties to a well-defined, but not exclusively owned, territory." He documents statements by early observers indicating that they considered the Tosawihi a distinct band in the early emigrant period.

Clemmer (2009a) also argues that the organizational simplicity noted by emigrants, and related to Steward, was likely a consequence of the historic disruption of food supplies and lifeways in general.

Tosawihi Quarries and Trade

The presence of the Tosawihi Quarries placed Tosawihi people in a pivotal position as traders of this toolstone material. The traditional importance of Tosawihi Quarries centers around three topics: medicine and power, economic pursuits, and Tosawihi as a focal point for ethnic identity (Rusco and Raven 1992:19).

Tosawihi chert was a valuable item both for use and for trade. The chert became widely distributed through trade networks; one consultant claimed it reached eleven western states; Rusco (1976) noted Tosawihi materials in archaeological sites up to 150 miles north and east of the quarries. Toolstone was exchanged for access to hunting and fishing lands to the north and, in historic times, for horses.

At the Tosawihi Quarries people collected toolstone, but also two medicinal and spiritual substances resembling red and white talc, called *beeshop* and *aipee. Aipee* is ingested in a powdered drink that resembles pepto bismol for stomach pains. Both are also taken for protection.

The use of the Tosawihi Quarries was not residential, but people made annual visits to the area. Rather, Tosawihi was the hub, and residential activities occurred in nearby favorable environments. There were much better place to stay locally, for instance the Maggie Creek/Susie Creek and Boulder Creek drainages to the east, where there was more food and shelter. There was a location just north of Carlin where *aipee* was traded. People also camped in the Midas and Rock Creek areas, particularly the mouth of Rock Creek Canyon. The same is true for the Boulder Creek and Antelope Creek areas south and east of Tosawihi (Tiley 2012).

The Tosawihi area was also a hunting and gathering locale, and trips there were a part of the seasonal round of the White Knife people. The Boulder Creek basin was rich in resources, and in evidence of old camp sites. Hot Creek to the east is very rich in old camp sites. The Willow Creek area to the north abounded in ground squirrels and groundhogs, and also once had greater sage-grouse and deer, as well as edible plants. Ground hogs (marmots) were taken in early July, while sage grouse came by the hundreds in the spring. Jackrabbits, snowshoe hare, and cottontails were all common. A turnip-sized root, *dosa*, was also collected. It was dried and smoked for congestion. The use of the Tosawihi Quarries area as a burial ground has also been noted (Clemmer 1990:18-19).

Their seasonal transhumance to the salmon areas of the Snake/Owyhee drainages put Tosawihi Shoshones in yearly contact with adjacent groups (Clemmer 1990:22). Fall pine-nut festivals, which brought the Tosawihi together with groups to the south in the central Nevada foothills and mountains would have also provided trade opportunities, as did combined antelope hunts with their Paiute neighbors to the west (Steward 1938:163). Local festivals were reported by Steward at Iron Point and Battle Mountain, although he notes Tosawihi people also attended festivals at South Fork, near Elko (1938:163).

Religion

Western Shoshones, who refer to themselves as *Newe*, were placed in their homeland by the creator, *Uteen Teikwahne*. According to oral tradition, two native women told coyote to carry a basket holding the *Newe* without opening it. Nevertheless, Coyote repeatedly opened the basket along his journey, dispersing people across a wide territory. This territory, called *Pia Sokopia*, would become the Western Shoshone homeland (Crum 1994:1).

Western Shoshone religion centers on the acquisition and use of *buha,* or power, the balancing of relationships between humans and the natural world, and guardian spirits. Most frequently, religious practice occurs as prayers by individuals, typically in gratitude for food, and prayers to sacred places and their resident spirits (Clemmer 1990:16).

Spirits are often associated with water, including lakes, springs, and water holes (Hultkrantz 1986:633). One of the kinds of spirits found there are water babies, powerful and potentially dangerous beings who live in the water (Miller 1983:75). About three feet tall and with a hard skin, they attract women and children to the water and drown them. De-watering resulting from mining may threaten these spirits (Deaver 1993:44). In addition, springs themselves are important locations in Shoshone cosmology; they are believed to be portals to the underworld.

Guardian spirits are sought in vision quests, often on mountaintops. They may also be sought at a Sun Dance. Not every person has this kind of power. White chert is also considered a source of power (Clemmer 1990:18).

Little Men, called *Nu:numu* or *Nenewe,* who lived throughout Western Shoshone territory, require that permission is asked to go into unfamiliar areas, and their cooperation is a key element in successful hunts. They could be malevolent or helpful, depending upon their treatment. According to Clemmer (1990) "they cannot be seen but they are always there. They whistle like a bird." There is particular concern regarding the Little Men in Tosawihi territory, because they abandon lands that are desecrated, and take the spirits of the game with them (Clemmer 1990:17).

Some places in the landscape were considered particularly imbued with *buha*. The area around Tosawihi Quarries is one of them. Three minerals at Tosawihi Quarries are used medicinally: white opalite, and red (*pisappih, or beeshop*) and white (*aipi*) rhyolitic tuff. Objects made from opalite are also viewed as possessing power. Tosawihi chert streaked in red is considered by some to be a powerfully harmful substance.

Big Butte, located outside but adjacent to the northern edge of the quarries is used for religious and ceremonial purposes. Big Butte was designated a TCP by the BLM in 1999. Recently (2016), the BLM expanded the boundary of the TCP around Big Butte (CRNV-12-9932) and established six other TCPs in the vicinity of the Tosawihi Quarries, including the Velvet Canyon-Doctor's House TCP (CRNV-12-18444) and Hunter's Spring (CRNV-12-18443).

Big Butte is part of a ceremonial/spiritual landscape in current use and connected to the Tosawihi Quarries, Antelope Creek, Coyote Mountain (Beaver Peak) and Black Mountain, along with trails, collecting areas, and springs used to make the spiritual journey to Big Butte. It is important to have an uninterrupted line of site with nearby peaks from the top of Big Butte. From Big Butte, one can see Coyote Mountain (Beaver Peak) and Black Mountain at the same time. Big Butte is valued by the Western Shoshone because it is a site used for vision quests. Doctor's House located in the vicinity of Big Butte is the spiritual center of the landscape and connects, through "buha" all the areas mentioned above.

The Rock Creek area was another area which is used ceremonially, and also is a burial location. It was previously a winter camp. There are several springs in the area, around which historic Indian farms were located. Contemporary people also visit the Tosawihi Homeland for curing at hot springs and to collect willow for baskets, particularly along Willow Creek (Clemmer 1990:19-20). The Rock Creek TCP was also designated by the BLM in 1999. The Rock Creek TCP is located approximately 19 air miles south-southwest of Big Butte.

In the historic period, some Western Shoshone became involved with the Sun Dance religion. Although the Eastern Shoshone had been practitioners since around 1800, the dance spread to Western Shoshone territory from Fort Hall around 1920 (Deaver 1993:42). The four Pabawena brothers, who were Tosawihi men from Ruby Valley/Starr Valley, held the first dance at Deeth (Clemmer 1990). Dances were also held at Elko and Battle Mountain in the 1920s, in Steptoe Valley and Elko in 1935, and again in Elko in 1946 (Deaver 1993:42). Sun Dance adherents were primarily of Tosawihi descent, as they were more closely tied to Northern Shoshone than other Western Shoshone people; some are still involved in the Fort Hall-derived ceremony (Deaver 1993:43; Clemmer 1990). In the 1970s, a Sioux-style Sun Dance ceremony was held at Duck Valley and Fort McDermitt (Jorgenson 1986). Lodges and grounds of previous sun dance locations retain *buha* (Deaver 1993:16).

Ethnohistory of the White Knife Shoshones

Clemmer (2009a, 2009c) has recently compiled very extensive chronicles of the ethnohistory of the Western Shoshones, and Tosawihis in particular. The following section relates the events that had the most pertinence to changing Tosawihi lifeways in the northern portion of Nevada. Clemmer makes the case that, in spite of profound historic era changes, Tosawihis were able to maintain their identity to the present day.

In addition to comprising a group prior to the arrival of Euro-Americans, Clemmer characterizes the White Knife group as one that has persisted through time. He states that,

> *Historic disruptions to their lifeways, particularly during the warfare and early reservation period, did not prevent them from the maintenance of a Tosawihi ethnic group with a Tosawihi ethnic identity. This identity has been reinforced to the present by the continued use of the Tosawihi Homeland for hunting gathering, doctoring, collecting white chert, and religious purposes. Families continue to identify themselves as Tosawihi people, and to pass down knowledge of the area; some who have never visited the quarry nonetheless had detailed knowledge of it. In the last 30 years there has been a resurgence of spiritual lifeways, and young people are increasingly involved. In this sense, Tosawihi Quarry is becoming more important to the Tosawihi identity (Clemmer 1990:22).*

Nevertheless, historic forces have scattered Tosawihi descendants and prevented many from obtaining first-hand knowledge of the Tosawihi Homeland. The following discussion centers on how Tosawihi Shoshones came to be dispersed from their Homeland across the Western Shoshone area into their present locations. Here, Clemmer's work has been amplified by Crum's 1994 ethno-history. This is essential information for management because descendants with connections to and concerns for the area are now located in several different areas, and associated with different reservations.

Early Contacts

The earliest contacts with non-Indians took place with trappers in the early nineteenth century. Peter Skene Ogden of the British Hudson Bay Company passed through Western Shoshone territory in 1828, pursuing a “scorched-earth” policy meant to destroy the beaver populations and leave the country depauperate and therefore undesirable to Americans who were extending claims to the Northwest (Miller and Miller 1971:107-108). The Walker-Bonneville Expedition in 1833-34 found few beaver along the Humboldt River and nearby drainages and trapping was abandoned after the fruitless Hamilton Expedition of 1845 (Clemmer 2009b:564). Although most researchers characterize this early period as having only a glancing effect on Great Basin lifeways (Rusco 1978), Clemmer maintains that the Western Shoshone used beavers for clothing and likely considered them a valuable resource; therefore the loss of beaver stands as the first of many disruptions to their cultural practices (2009b:564-565).

Changes to Lifeways

The migratory lifeways of the Tosawihi were enhanced by the introduction of horses, which they seem to have procured earlier than other Great Basin groups. They may have gotten them in trade prior to 1860; Clemmer wonders whether the trading of white chert to the north enabled their early access to horses (Clemmer 1990:2, 23). As early as 1828, Hudson Bay Company trapper Peter Ogden, following the Humboldt River near its confluence with the Little Humboldt reported that he was following an “Indian track” that had been travelled by 400 horses. In the westernmost part of Western Shoshone territory, he came upon a camp of 300 persons, stating “it is almost indescribable how numerous the natives are in this quarter.” Near Dunphy, at the confluence of Boulder Creek and the Humboldt River, he reported that Indians were “most numerous” (Ogden 1971:107-108).

The environment was affected by early trappers, and most extensively, by emigrants following the Humboldt River. The depletion of the beaver population has already been noted. Antelope, perhaps a more important resource, became scarce as domesticated animals competed with them for forage, and roads crossed their migration corridors. The last antelope drive in this area was held in the 1870s (Steward 1938:34-36).

Tremendous environmental destruction was reaped by the passage of thousands of emigrants and their livestock. Game was hunted out or scared away, water holes were polluted or made inaccessible, fishing spots were usurped, waterfowl depleted, and economically important grasses were destroyed. As their food supplies diminished, native peoples began stealing livestock, leading to a series of raids and reprisals. Once ranches and farms were established, many resources were permanently out of reach and heretofore undamaged resources areas were lost (Crum 1994:21). Due to these factors, historical accounts of the Tosawihi, and other nearby Shoshones, stressed their impoverished state. Steward states, “Although the Humboldt River was the main immigrant thoroughfare, early descriptions of its natives were generally limited to comments on their poverty” (1938:152). The statement would be more accurate if rephrased “*Because* the Humboldt River...,” since it is likely that it was activities of emigrants that caused the poverty.

Mining activities reached their early peak in the area between 1863 and 1875, when Tuscarora and Midas swelled in population (Clemmer 2009a: 862). Although the greatest effect was to areas adjoining the Humboldt River to the south, the Tosawihi people’s southern range would have been affected. In particular, the mines’ need for lumber for buildings, shoring, and charcoal to fuel the smelters destroyed pine nut stands that were critical winter food sources for Shoshones (Clemmer 2009a:863-864).

The activities mentioned above would have also changed settlement patterns, both by attracting Shoshones to ranches, mines, and towns for wage labor, and by rendering old settlement areas uninhabitable. Clemmer (2009a:865), as a result, questions whether the purportedly “aboriginal” villages noted by Steward were in fact in the locations villages would have been prior to Euro-American contact.

Other changes were related to the introduction of various material goods to Shoshones by Euroamericans. As was the case of in the introduction of the horse, material goods entered Shoshone communities at surprisingly early dates. P.V. Crawford (1924:149) noted Indian people at Salmon Falls in 1851 desiring to trade surplus fish “for almost anything . . . but shirts were their greatest want.” In 1852, another emigrant noted a desire to trade for “old shirts, cooking utensils, fish-hooks, powder or anything they can get. . . .” (Hanna 1852:23, in Allen 1991). Yet another emigrant noted Indian “fishmongers” anxious to obtain ammunition, but willing to trade for apparel and tin ware (Handsaker 1853:23-24). Guns were observed in

the area as early as 1846 (Steward 1938:152). At times the Tosawihi band sought this trade. Agent Garland Hurt noted that the White Knives he encountered in 1856 at Stony Point near Valmy lived "north and had come over to trade with the emigrants." He noted that they were "well supplied with guns and horses" and wanted to trade for ammunition. He later saw fifty White Knives near Gravelly Ford (Clemmer 2009c:406).

To a great extent, this burgeoning trade replaced the old exchange of Tosawihi chert for goods after the introduction of firearms rendered stone tools less necessary. Even by 1856, Agent Hurt noted that the White Knives in the example above "derive their name from a beautiful flint found in the mountains of that region, and *formerly* used by them as a substitute for knives in dressing their food" (emphasis added). It would appear that these traditional traders had found fish the new commodity with which to obtain weaponry.

Conflict and its Consequences for Social Organization

As was the case for other Western Shoshones, the response of Tosawihi people to the invasion of their territory involved profound changes in social organization. They formed new, larger bands made up of several extended families from each territory, drawing upon traditional leadership, to protect themselves and drive away the encroaching Euro-Americans (Crum 1994:18). It was on the basis of such accounts that Steward (1938) maintained that White Knife band organization was an example of the outcome of historic changes; he termed such post-contact units "predatory bands." It has been suggested that these activities may have changed their social organization, "welding" them into a more cohesive group (Harris 1940). Not all scholars agreed: both Stewart (1942) and Service (1962) argued that band formation in many parts of the Great Basin occurred before contact, and Clemmer warns that many accounts of "Tosawihi" raiders may in fact have referred to actions by Goshute Shoshone (2009c:413). In any case, Tosawihi Shoshones possessed a "sizeable and powerful organization" by the mid-1850s (Crum 1994:18).

Certainly, the early acquisition of guns and horses enhanced the efficacy of the Tosawihi band. By the mid-1850s, Garland Hurt, the Utah territorial Indian agent, reported that "the Tosawihi were well supplied with guns and horses and were willing to trade for ammunition" (in Crum 1994:21). Raiding emigrant trains now not only supplied food, but weaponry and ammunition.

During the ethnohistoric period, horsed Tosawihi Shoshones ranged far outside the limits of their traditional homeland, and acquired a reputation as fighters. Crum (1994:19) states that "more than any other Newe band, the Tosawihi became known for their aggression against the whites." Tosawihi Shoshones often appear in historical accounts as horsed raiders. Warren Wasson, an Indian agent, warned Nevada Governor Nye of "the danger of interruption by Indians to the mail and telegraph lines apprehended during the coming spring is from a band of Sho sho nees (*sic*) called "White knives" occupying the country between the Upper Humboldt and the present mail road. . . . " (Wasson 1862).

Other groups of Shoshones took a less militant view, perceiving cooperation with Whites as an alternate way to survive given the destruction of traditional resources. In Ruby Valley, the leader *Sho-kub* (*Tsokkope)* began planting potatoes, wheat and squash. A change of administration of the Office of Indian Affairs allowed this nascent farming attempt to founder, and the promised six-mile-square Ruby Reservation was never established as settlers took over the valley. Perhaps in response to these disappointments, *Sho-kub* appointed Buck, a young subchief, to succeed him after this death in 1861 (Crum 1994:22). Buck did not share Sho-kub's optimism about a friendly solution to the settler problems.

The choice of Buck appears to have fragmented the group politically (Clemmer 1990:23); Buck and his supporters left Ruby Valley to join to Tosawihi resistance north of the Humboldt (Crum 1994:23). Together they attacked emigrant trains, stole cattle, and attacked Overland Mail stations. These actions prompted a U.S. military response. In 1862 Fort Ruby was established, and Colonel Patrick E. Connor and his California volunteers embarked upon a spree of indiscriminate killing of the *Newe*.

The Treaty and Reservation Period

At last, both sides tired of conflict. Two treaties were negotiated with the White Knives and other Shoshone people. A treaty of friendship in 1855 with the U.S. government was never ratified. The Ruby Valley Treaty of 1863 was ratified. Buck signed the treaty on behalf of the White Knives. Although no land was ceded, Shoshone people were to move onto reservations provided for them. The Shoshones upheld their part of the treaty, by remaining peaceful; the United States is seen by many as not performing on

their portion of the treaty, taking lands and withholding the promised annuity payment in goods for the damage to the Western Shoshone homeland during the emigrant period (Crum 1994:27).

In 1877, two Western Shoshone reservations were set aside, one at Carlin Farms, and one at Duck Valley, though the majority of Western Shoshones continued to live off-reservation in their homeland. Ethnohistoric information indicates that a White Knife leader, Captain Sam, was instrumental in asking for a reservation in Duck Valley, a part of his Tosawihi homeland (Crum 1994:35; Inter-Tribal Council 1976:72-74; Clemmer 2009c:407-408). Carlin Farms was specifically set up for agriculture by Tosawihi Shoshones who had labored on farms owned by settlers in the area since 1868 (Crum 1994:36). On the basis of the success of their farm, other Shoshone groups were encouraged to move to Carlin; Buck and many of his supporters in Ruby Valley agreed to the move.

Shoshone people, including White Knives, were then evicted from Carlin Farms in 1879, when the U.S. General Land Office asserted that most of the land had been claimed by White settlers prior to 1877(Clemmer and Stewart 1986:534; Crum 1994:37). Captain Sam and the White Knives from Carlin Farms reluctantly moved to Duck Valley, which was open to all Shoshone people. In 1879, Captain Buck moved his people from Ruby Valley. Crum (1994:55) relates Thomas Premo's story of the move. According to oral tradition, six Shoshone men went to assess Duck Valley as a place to live:

> *. . . There were many different kinds of food stuffs available here: there were many ducks, many sage hens, lots of deer, and they were not going to run out of firewood. Nor were they going to run out of fish.*
>
> *Soon afterwards, they came here [to Duck Valley]. They were moved here under Captain Buck. This is what they did. They drove their cattle here, which were given to them at Ruby. . . . They also gave some cattle to some of those that did not come from Ruby. Then, when they settled down, their cattle, kept in the care of one man, increased in number.*

Chief Te-Moke and his people chose to remain in Ruby Valley (Crum 1994:36), in part because of their attachment to their land, and in part because of uneasy relations with the Tosawihi group. Their different approaches to handling the white incursion into their lands still divided them, though both were peaceful at this point (Crum 1994:38).

Poor conditions at the Duck Valley reservation caused many families to leave by 1882. An attempt was made to abandon the reservation in 1884, and remove the residents to Fort Hall; however, opposition by the remaining families was so strong that this never happened. Some families returned to the Tosawihi Homeland and continued to hunt, gather, doctor, and collect chert there, and some sought wage labor in the vicinity at mines or ranches to establish seasonal or long-term residency (Clemmer 1990:23). The reservation was enlarged in 1886 to accommodate Northern Paiute Indians (Inter-Tribal Council 1976:75-76). Tosawihi identity was maintained at Duck Valley, although over time personal associations with the land declined for some families.

Historic Relationships to the Tosawihi Homeland

Some White Knife families found employment in their homeland. Clemmer (2009a:72-73, 1990:18) and Raven and Rusco (1992:12) reported hunting, buckarooing and haying for white-owned ranches, ritual use of the area, chert collection, and plant gathering into the 20th century.

People from Duck Valley, Starr Valley, Deeth, and Fort Hall came down for this seasonal agricultural activity from ca. 1927 to ca. 1965; among the ranches where they worked were the Betty O'Neill, Eisenhood, Hadley, 25 Ranch, and Spanish Ranch, as well as an unnamed ranch at Midas (Clemmer 1990:14, 21; Tiley 2010). Their familiarity with the landscape allowed them to supplement their income through traditional hunting and gathering activities. Newspaper accounts and oral traditions indicate that fandangos and other Indian activities continued to take place in the Tosawihi Homeland.

Clemmer (1990:20) was told that Shoshone settlements and camps continued to be used in the Antelope, Rock, Rattlesnake, Boulder, and Willow Creek drainages until the late 1920s as farms and homesteads. The large farm on Antelope Creek and the Rock Creek settlement area are located in the areas appearing as villages on Steward's 1938 map; the scale of this map precludes its inclusion in this report, although a settlement map symbol does appear on the Rock Creek drainage hand-drafted by Steward.

Steward does note that the hunting and gathering areas for the Tosawihi Shoshones were in the mountains “around Rock Creek” (1938:162).

The American Indian farmers and ranchers faced challenges in an environment not wholly suited to agriculture, and many had to abandon these enterprises. Those who had enjoyed some success were removed by the federal government and sent to the Battle Mountain Colony, which was established in 1917. The colony was created for non-reservation Shoshones, on the premise that they would enjoy services provided by the federal government there such as housing and a school (Crum 1994:73). The promised benefits at the Battle Mountain Colony took decades to be put in place. The vacated land was subsequently purchased by non-Indians (Clemmer 1990:21).

The Rock Creek area continues to be used ceremonially, and also is a burial location. It was previously a winter camp. There are several springs in the area, around which historic American Indian farms were located. Contemporary people also visit the Tosawihi Homeland for curing at hot springs and to collect willow for baskets, particularly along Willow Creek (Clemmer 1990:19-20).

More Recent Political Developments

Following the Indian Reorganization Act of 1934, the Te-Moak Tribe of Western Shoshone began as a governing body with a council, charter, and constitution in 1938 (Crum 1994). The organization gained membership as a coalition government particularly after the 1960s, holding jurisdiction over its member bands in issues regarding existing Tribal lands. Today, four bands are members: Battle Mountain Colony, Elko Colony, Wells Colony, and South Fork Reservation.

Duck Valley did not join the Te-Moak organization, choosing to negotiate separately with the federal government.

In 1984, a larger organization, the Western Shoshone National Council, was created to act as a centralized political entity (Crum 1994:173). Its membership includes most of the Western Shoshones in Nevada. Its efforts are focused upon the Western Shoshone Land claims cases.

Individual bands have also been active in revitalizing Western Shoshone culture, particularly since the 1960s. Some of these activities include fandangos, Shoshone language lessons, the writing of tribal histories, the resurgence of various fine arts, annual tribal gatherings, and participation in intertribal spiritual and religious gatherings (Crum 1994: 264-267).

3.6.1.4 Ethnographic Analysis as it Relates Specifically to the Rossi Mine Site

As a result of the ethnographic study completed for the Rossi Mine Project, BLM identified fourteen areas of importance to the cultural identity of the Western Shoshone people. Of these fourteen areas of importance, four areas are located within the proposed PoO boundary for the Rossi Mine Expansion Project (The Sage Grouse Dance Place TCP is partially within the proposed PoO boundary). The other ten locations are located near or within 20 miles of the project area. Several additional areas of importance are located 20 miles or more from the project area. The four sites identified that are located within the direct and indirect effects APE qualified as potential TCPs eligible for listing on the NRHP. These TCPs have been recently (2017) defined by legal boundaries and designated as TCPs by the BLM. These areas of importance to the Western Shoshone people may consist of a combination of prayer places, ceremonial gathering places for plants, medicine and dance, hunting areas for wildlife, ceremonial trails and traditional travel routes, potential burial sites and spiritual sites. The Rossi Mine site or project area is located between Antelope Creek on the west side and within one mile of Boulder Creek on the east side of the proposed PoO boundary. The project is also located on the divide between two hydrologic basins and is located on a natural pathway between these two hydrologic basins for Antelope Creek and Boulder Creek.

Some general information the Western Shoshone have expressed for the importance of the project area is that the few springs and creeks in the area of the Rossi Mine provide critical water sources to the area as well as riparian vegetation. This vegetation provides a diversity of plants needed for food, medicine, ceremonies and basketry. Springs are also important because of the beings that inhabit them. They are used for healing, ceremonies, plant gathering and cooling the Tosawihi chert so it can be crafted into tools. Water also brings wildlife into the area, which allows for hunting. Mountain and ridge tops in the

area of the mine are important places because they are used for prayer and vision quests; therefore, maintaining access to these areas is critical. For example, Western Shoshone have stated that the tops of Big Butte, Beaver (Coyote Mountain) Peak and Black Mountain are used for vision quests and can be seen from each other. Big Butte is located approximately nine air miles to the northwest, Beaver (Coyote Mountain) Peak is located approximately nine air miles east, and Black Mountain is located approximately fifteen air miles southwest of the Rossi Mine. All of these mountain tops are visible from the project area and could also be used as landmarks. The Rossi Mine sits in the center of the triangle created by these mountain peaks. Therefore, trails through the area have provided access routes connecting the other various surrounding areas of importance to the Western Shoshone such as Antelope Creek to the west-northwest, Tosawihi Quarries and Big Butte to the northwest, Boulder Valley to the south, the Humboldt River to the south, the Snake River Valley in Idaho to the north, Doctor's House to the northwest and Beaver (Coyote) Peak to the east. The portion of the Velvet Canyon-Doctor's House TCP that is visible from the Rossi Mine is located approximately five air miles away to the northwest. The Hunter Spring TCP is located approximately five miles to the northwest of the Project. The Rock Creek TCP is located approximately 18 air miles southwest of the Rossi Mine and can also be accessed through the project area when one is coming from the east. Ceremonial trails and travel routes important to the Western Shoshone connect areas of importance such as the Tosawihi Quarries and Doctor's House, which are located at the center of their spiritual world.

Based on the ethnography report and more specific confidential information provided to the BLM, the BLM determined the four areas located within the proposed PoO boundary for the Rossi Mine project are eligible for the NRHP as TCPs as described in Section 3.5, Cultural Resources. The Western Shoshone people did not provide specific dates or times during the year for when these historic properties are used; therefore, the specifics for time of use are unknown. These historic properties are:

- Prayer Land or Praying Place TCP (CRNV-12-18615) [*Nanisuntehain Sokopin*]: This site has been determined eligible for the NRHP under criteria A.
- Morning Sunrise Prayer Place TCP (CRNV-12-18616) [*Imaa Tapaito'I Nanisuntehain*]: This site has been determined eligible for the NRHP under criteria A.
- Monster Grave/Antelope Creek Coming In Prayer Place TCP (CRNV-12-18618) [*Tso'apittseh Nakuu/Kwaheten Okkaikkinne Yuampitch Nanisuntehain*]: This site has been determined eligible for the NRHP under criteria A and B per consideration C.
- Sage Grouse Dance Place/Chicken Dance Ground TCP (CRNV-12-18617) [*Huittsan Nekka/Tsikkina Nekkah*]: This site has been determined eligible for the NRHP under criteria A.

3.6.2 Environmental Consequences

The project-specific issues for the effects analysis were identified based on the information provided by the tribes during consultation, communication, coordination, information sharing, and the ethnographic study prepared for the proposed project (McBride and Tiley 2016). Ethnographic effects would be considered significant if the proposed project would result in adverse effects to NRHP-eligible properties of cultural and religious importance to the Western Shoshone.

The analysis of potential effects to Native American traditional values was prepared in accordance with NEPA. For purposes of this analysis, the effects of federal undertakings on properties of religious or cultural significance to contemporary Native Americans are given consideration under the provisions of EO 13007, American Indian Religious Freedom Act, and recent amendments to the NHPA. As amended, the NHPA now integrates Indian tribes into the Section 106 compliance process and also strives to make the NHPA and NEPA processes compatible. Furthermore, under NAGPRA, culturally affiliated Indian tribes and the BLM jointly may develop procedures to be taken when Native American human remains are discovered on federal lands. The NEPA process does not require a separate analysis of effects to religion. As a result, references in the analysis to religious beliefs or practices only convey the terminology used by tribal representatives and elders during conduct of the ethnographic study and tribal consultation and coordination conducted for the proposed project. This terminology does not reflect any BLM evaluation, conclusion, or determination that something is or is not religious, sacred, or spiritual in nature, but only conveys the information that has been gathered through tribal consultation and coordination and the ethnographic study.

The project effects include the direct, indirect, and cumulative effects of the proposed expansion of the Rossi Mine on traditional cultural properties or historic properties in the vicinity. Direct effects are those that have a direct physical effect on a historic property; Indirect effects are reasonably foreseeable impacts caused by the Proposed Action (size and scope), but occur later in time or are further removed from the Proposed Action than the direct effects. Cumulative effects include those on the environment, when added to other past, present and reasonably foreseeable future projects.

3.6.2.1 Proposed Action

Potential Effects within the PoO Boundary

Tribal representatives expressed several areas of concern about the Rossi Mine Expansion Project, centering on two themes: the destruction of historic properties and the loss of cultural traditions. Specifically, tribal representatives expressed concern over water loss, restriction of access to sites of tribal cultural value, hunting and plant gathering, visual and audible effects, spiritual effects and social effects resulting from loss of traditions. However, the Western Shoshone people have not provided any information or specific dates, season or timing of when they use or visit the area within the proposed PoO boundary or surrounding the Rossi Mine.

During meetings and other exchanges with the Western Shoshone people, a primary concern raised in regard to the proposed Rossi Mine is the destruction of and/or restriction of use of historic properties within and outside of the proposed PoO boundary, which includes direct and indirect effects, due to the impacts associated with surface mineral exploration and mining operations. Some general concerns expressed by the Western Shoshone people and reasons for their opposition to the mine expansion proposal are the:

- Restriction of access due to the mine safety requirements. Restriction of access prevents the Western Shoshone from using the TCPs, gathering plants for ceremonies and medicine, hunting for wildlife and accessing historic properties. This would keep them from accessing places where memories are formed and where elders show younger people the traditional ways, something that is critical to cultural continuity. Loss of access means loss of cultural traditions and cultural degradation.
- Effects on water consist of water consumption, such as the dewatering of springs for use in mining activities, which affect the natural environment and the availability of plant and animal resources. Water loss issues consist of drying up springs, streams, and creeks, which could cause an effect to the spirits in the area.
- Hunting issues are increased traffic, noise and habitat loss. Hunting is an important activity still carried out by Shoshone people where young people learn hunting rituals and about their connection to animals. The loss of hunting rituals came along with a loss of connection with animals and a general loss of wildlife in the region due in large part to mining development.
- Plant gathering or medicinal issues from the destruction of plants. Plants and minerals are gathered for ceremonial and medicinal purposes. Also, the loss of plant resources leads to a loss of traditional information being passed to younger generations about the uses of plants.
- Visual effects, which are a major concern, consist of cutting off line of site to Big Butte, Doctor's House, Black Mountain and Beaver (Coyote) Peak. The view of the Rossi Mine from important mountain tops diminishes the quality of ceremonies being conducted at those locations.
- Audible effects resulting from traffic noise, blasting, and mining prevents contact with the Creator and scares away the spirits in the area. Serenity is an important part of the spiritual experience in the project area and surrounding areas.
- Spiritual effects from mining industry activity may scare spirits, vibrations from haul trucks disturb the spirits residing in the area, prayers are disrupted by noise or from passers-by, and mining restricts access to prayer and resources sites or prevents passage to and from Antelope Creek.
- Social effects include the loss of traditions. Mining and its associated effects destroy sacred sites, scares game/wildlife, dries springs and creeks, disrupts lines of sight, and prevents the passing of religious, social, and economic knowledge from one generation to the next.

The direct effects of the Proposed Action for the mining operation and surface exploration within the PoO boundary on the TCPs and traditional values include:

- Restrictions on access could include blocking, restricting, limiting, delaying, and removal or eliminating it. These types of restrictions could apply to the entire area inside the proposed PoO boundary which would also apply to the historic properties (TCPs and archaeological sites), the active mining and exploration operations areas, roads and travel routes. These types of restrictions would be implemented because of safety for the employees and public (i.e., Western Shoshone, recreationist, hunters, sightseers, etc.), regulations for mining and exploration operations, and the implementation of the Proposed Action, such as the construction of facilities or temporary delays due to blasting or moving equipment. These types of effects to access roads or travel routes would exist until such time as mining and exploration end and reclamation is complete. Public access around and partially through the mining operations would continue to Antelope Creek and to the north of the mine site; however, delays may occur due to blasting, construction activities, moving equipment or escorting by the mine. The potential restriction of access to historic properties through road closures or fencing associated with the Proposed Action would keep the Western Shoshone from accessing areas they use. Restrictions could prevent the Western Shoshone from conducting prayers, ceremonies, gatherings, or other uses of the TCPs within the project area or PoO boundary. For effects to cultural resources see Section 3.5, Cultural Resources.
- Few springs, streams, and creeks exist within the proposed PoO boundary. The Proposed Action may cause the spirits to leave that inhabit these waters. These waters would not be accessible to the Western Shoshone for prayer or ceremonies while the mining operations and exploration activities are occurring because of the mine safety requirements for employees and the public. See Section 3.4, Water Resources.
- Hunting would be restricted or eliminated within the proposed PoO boundary during mining operations and exploration activities due to mine safety requirements for employees and the public. Hunting has been restricted or eliminated within the existing PoO boundary since the mining operation began in 1947. Hunting, in accordance with NDOW regulations would continue to be available in the vicinity or area surrounding the mine. Wildlife may avoid the project area due to mining operations. Wildlife habitat would be removed with the construction of the WRDF and mining operations and facilities. Habitat loss within the project area would last until successful reclamation occurs. See Section 3.17, Wildlife and Aquatic Biological Resources.
- Plant gathering would be restricted or eliminated within the proposed PoO boundary during mining and exploration activities due to mine safety requirements for employees and the public. Plant gathering has been restricted or eliminated from within the existing PoO boundary in order to provide for the safety of the employees and public. These actions would affect the gathering of plants and minerals for medicinal and ceremonial purposes. Plants may be removed or destroyed at the mine and exploration sites and would be no longer available until successful revegetation occurs. However, the plants within the project area are the same as the plants in the area surrounding the project area, which is open to the public for use. See Section 3.14, Vegetation, including Riparian Zones and Wetland Areas.
- Visual effects may occur from dust caused by blasting, construction activities, and traffic. These effects would diminish or disrupt the view or viewshed of people participating in prayer, ceremonies, and spiritual gatherings or rituals. These effects would be temporary and minimal. Dust from blasting lasts for a short period of time (i.e., minutes) until it settles or disperses in the atmosphere. Construction and mining activities (i.e., building roads, WRDF, etc.) are watered to limit fugitive dust emissions. Dust from traffic may also occur from recreationists traveling through the area. Watering roads during maintenance activities may occur to reduce dust. Other visual effects would be impairment from the mine facilities, night lighting, equipment and traffic. The mine facilities such as the WRDF could block or diminish the direct line of sight or viewshed to ridge or mountain tops or the TCPs depending upon one's location because the height of a WRDF may obstruct the views from various vantage points. This would be a permanent change on the landscape or topography as WRDFs would be reclaimed in place. The mine facilities such as the WRDF may be more pronounced or stand-out on the landscape due to color contrasts and

changes to form, line and shape comparative to the natural topography. This effect is temporary and would last until such time as reclamation is complete and revegetation is successful. Lighting (daytime and night) could diminish, distort or create a distraction to the viewshed toward the mountain tops or the night skies. This effect would be lessened using methods to direct lighting toward the ground when applicable. This effect would also exist until mining, closure, and reclamation activities are complete. Equipment for both mining and exploration and traffic from the mining operations, exploration and the public may create a disruption, distraction or intrusion to the viewshed, prayers, ceremonies, and gatherings. See Section 3.12, Visual Resources.

- Noise is created by the mining operation and surface exploration activities. Items or activities that create noise consist of, but are not limited to equipment, vehicles, construction activities, ore processing, traffic, hauling ore, road maintenance and blasting. Noise occurs at various duration levels or degrees of loudness and intensity throughout the project area and throughout the day and night or working hours. This noise may affect the solitude and serenity of the area and it may scare away the spirits in the area. It may cause interference and disruption to prayers, ceremonies and communications with the Creator occurring in the area. However, the noise at the Rossi Mine created from mining and exploration activities has occurred since mining began at this site in 1947. According to the Western Shoshone people, they have continued to use the area over all these years. The types, duration, levels, loudness, and intensity of noise created by the mining operations and surface exploration activities that would occur from the Proposed Action would be the same or similar to the noises that have occurred at this site for the last 60 years. The noise created by the mining activities would last until such time as the mining, closure activities, and reclamation have been completed at the site. Noise created by surface exploration activities would be temporary, lasting for a short duration of days to weeks per year and this noise would occur sporadically within the PoO boundary. Depending upon the work schedules and the mine operations schedule, noise levels would increase or decrease as a result of the activities of the mine, which would vary in level and scope. See Section 3.20, Noise.
- Equipment for both mining and exploration could create vibrations that may disturb or scare away the spirits within the area, including the TCPs and the surrounding area. The heavy equipment used in mining process and for construction activities can create vibrations in the ground. The process of surface exploration drilling also can create vibrations in the ground. Vibrations in the ground would be localized within the PoO boundary to the location in which the equipment is working. Effects from ground vibrations would be sporadic throughout the project area. The ground vibration would be temporary and short-term. The equipment used at the mine is similar to the equipment that has been working in this project area since 1947. Exploration activities have occurred throughout the project area since the 1970's up to the present. These activities would last until the mining and reclamation activities are complete.
- The elimination of access to the TCPs and areas of ceremonial, spiritual or prayer activities. Use of these places by the Western Shoshone may be eliminated, limited or curtailed because of damage or destruction during the implementation of the Proposed Action. Access restrictions would last until the mining and exploration activities are completed and the area has been restored and rehabilitated. Access restrictions would only apply to the area within the proposed PoO boundary. The main access routes through the mine site would remain open for use to travel through the mining area. The segments of the main access roads that are affected by the mining activities would be rerouted and replaced in order to maintain access through and around the mining operations. Ceremonies and spiritual activities such as prayer or plant gathering activities may be watched or viewed by employees, recreationist or the public when ceremonial or prayer activities are located along the existing roads or below the ridgelines of hills and mountains in the area.
- Western Shoshone people have repeatedly stated that surface disturbance and reclamation activities within a TCP do not necessarily affect the TCP because these sites have to do with religion and spiritual values. How potential effects affect the use of the TCP is dependent upon the characteristics or criteria used in the evaluation and determination of the TCP, which is confidential information. The effects that affect the TCP are intangible and are associated with ceremonies, prayer sites, spirits and religious beliefs. Therefore, the primary effect is probably the loss of availability and accessibility of these sites due to the mining and exploration activities until the mining and reclamation operations have been completed and the mine site is closed. Since

three of the TCPs are located within the proposed PoO boundary they would be subject to MSHA regulations, which includes restricted or limited access for the safety of the public and could be inaccessible for conducting ceremonies, prayer or religious practices until the mine site has been reclaimed and is closed. The mine operations schedule would affect when the TCP could be used. Since the tribes have not informed the BLM when these TCPs are used, time of use for the TCPs is unknown.

Traditional Cultural Properties within the PoO Boundary

Prayer Land or Praying Place [*Nansuntehain Sokopin*] (CRNV-12-18615) is located within the proposed PoO boundary. The west side of this TCP may be directly affected by the construction of the proposed Dawn WRDF, surface exploration activities, removal of vegetation for the construction of the WRDF and exploration activities, traffic or maintenance on the existing Boulder Valley Road, noise from equipment and vehicles, and dust associated with the Rossi Mine and mining and exploration operations at the neighboring Arturo Mine. While standing within this TCP visual effects of the mining activity occurring at the Rossi Mine are limited due to the terrain or topography. Most visual effects would occur from the neighboring Arturo mine and consist of seeing the open pits and WRDF. Also visible from this TCP are the old corrals, a loading chute and corrals. Other noises at this TCP would be from cattle during roundup and release into the pastures. The northern end of this TCP may no longer be accessible, but the southern portion of this TCP may have limited access availability. Indirect effect at this TCP during sunrise, sunset and night time hours would be the night lighting from the mines, which would mainly come from the Arturo, Goldstrike and North Operations mining operations as well as the noise from these other mines and exploration activities in the Carlin Trend, which currently exists. This TCP is not within the direct line of sight between Beaver (Coyote) Peak and Black Mountain; however, it is located within the viewshed. This TCP is not visible when looking from Beaver (Coyote) Peak or Black Mountain. This TCP is partially visible (northeast corner) from the top of Big Butte and is also partially visible from the summit of Craig Peak. Surface exploration and reclamation activities have occurred within this site in the past from the 1970's up to 2014.

Morning Sunrise Prayer Place [*Imaa Tapaito'I Nanisuntehain*] (CRNV-12-18616) is located within the proposed PoO boundary. The west side of this TCP would be affected by the construction of the proposed QLC East WRDF and surface exploration. Drivable access to this location would be eliminated due to the proposed WRDF location and relocation of the Boulder Valley Road. The east half of the TCP would remain accessible by foot. Currently the Rossi Mine operations are visible from this TCP and would continue to be visible. Therefore, the direct effects would continue to be noise and dust associated with the mining operation, visual effects from the mining operation, including night lighting. Surface exploration and reclamation activities have occurred in the past from the 1970's up to the present. Access to this TCP would probably be restricted until such time as mining and reclamation are completed. Indirect effects would be the same as the direct effects. This TCP is not within the direct line of sight between Big Butte and Beaver (Coyote) Peak; it is located within the viewshed. When looking at this TCP from the top of Big Butte or from Craig Peak, the west side of the TCP is partially visible. From the top of Black Mountain, a small portion of the west side of the TCP is visible and this TCP is not visible from the top of Beaver (Coyote) Peak.

The Monster Grave/Antelope Creek Coming In Prayer Place TCP [*Tso'apittseh Nakuuk/Kwaheten Okkaikknne Yuapitch*] (CRNV-12-18618) is located mostly within the proposed PoO boundary. The direct effects to this TCP would occur from expanding the King open pit, surface exploration activities, noise from mining and exploration activities, visual effects from the mining operation and surface exploration activities, construction of the proposed road around the end of the King WRDF, and expansion and construction of the WRDFs. Surface exploration and reclamation activities have occurred in the past from the 1970's up to the present and have the potential to occur in the area of this TCP in the future. Availability and access to this TCP would probably be restricted or eliminated due to its location to the proposed pit expansion. The same type of mining and exploration activities have been occurring near this TCP as are proposed; however, implementation of the Proposed Action would cause the mining operations to occur closer to the TCP.

Until such time as mining is done and the reclamation and closure activities have been completed at the Rossi Mine and surface exploration has stopped, the Proposed Action would create an effect to the

religious, spiritual and sacred values expressed by the Western Shoshone. The lack of access to the TCPs may be the primary cause of the effect.

Under the Proposed Action, exploration would continue throughout the project area as described in Section 2.3.10, Exploration. Effects from exploration would include increased noise and human presence within the PoO boundary potentially temporarily disrupting the solitude of sensitive tribal sites. Direct effects to general vegetation from exploration would include short-term loss of approximately 67 acres. Locations of future exploration activity depend upon the results of drilling activity; therefore, specific vegetation types that would be affected cannot be identified. Indirect effects resulting from exploration activities would include increased fugitive dust, vibration, and localized soil compaction during road and pad construction and active drilling operations. Exploration would also result in an increase of fragmentation of the existing vegetation communities within the project area.

Potential Effects Outside the PoO Boundary

The Sage Grouse Dance Place TCP [Huittsn Nekka] (CRNV-12-18617) is located partially within the proposed PoO boundary. Direct effects to this TCP would result from traffic and maintenance on the existing road, noise and dust from traffic on the road, and visual effects from the King North WRDF blocking the view of the terrain, and mining operations, associated facilities and surface exploration activities diminishing or interfering with the view, including night lighting. Indirect effects to this TCP consist of noise such as equipment, traffic and blasting from the mining operations at the Rossi Mine, noise from recreationists, cattle, power lines (buzzing noise), and other land users in the area such as the ROW holders, and the permittee may create visual impairments that diminish or interfere with the view such as dust, equipment in the viewshed and lights from equipment. This TCP is visible from the top of Big Butte. This TCP is not visible from Black Mountain and Beaver (Coyote) Peak. This TCP is partially visible from Craig Peak and partially obscured by the King North WRDF at the Rossi Mine. It is accessible by the public road from the north as well as through and around the Rossi Mine. Since this TCP is located outside the proposed PoO boundary there would be no restrictions to access it from the public road. If the Western Shoshone choose to access it by way of the Rossi Mine, they may encounter temporary delays if it is during the time of blasting in the King Pit or if the mining operation were to have the Boulder Valley or Antelope Creek road blocked due to mining operations or moving equipment. This TCP is located within the indirect APE for the project.

There are no access restrictions outside of the proposed PoO boundary. The area outside the proposed PoO boundary is available and accessible for gathering plants, recreation activities and other uses, including hunting in accordance with the State of Nevada hunting regulations administered by NDOW. Wildlife may avoid the mine site, but would be dispersed into the surrounding area.

Indirect effects to the TCPs would consist of noise intrusions from the mining operations and equipment, blasting, surface exploration activities and equipment, and traffic. The intensity or loudness of the noise would vary dependent upon atmospheric conditions such as wind and weather, distance, time of day, topography, type and its relationship to the use such as ceremonial, spiritual or prayer activity or TCP use occurring outside the proposed PoO boundary. Noise may momentarily interfere with activities occurring at the TCPs or it may be a constant lasting all day. The noise may diminish the serenity at the TCPs. Visual effects would come from the mining operations, dust, and night lighting impairing, blocking or diminishing the views of the terrain, ridgelines and other TCPs, which currently exist. However, over the years the indirect effects may have become more pronounced and potentially increased in intensity as the mining operation has expanded and surface exploration has continued in the project area, but the effects remain the same or similar in type and have occurred since the mining activity began in 1947. Although the area outside of the proposed PoO boundary remains available and open for the Western Shoshone to access, use and visit, it is unknown whether or not the Western Shoshone may eventually choose to stop or continue conducting their ceremonial, spiritual or prayer activities and TCP use outside of the proposed PoO boundary.

Implementation of the Proposed Action may result in indirect effects to locations of importance to the Western Shoshone in the region, such as Big Butte, Beaver (Coyote) Peak and Black Mountain by diminishing the quality of ceremonies on the mountain tops. Appendix C provides illustrations of the Rossi Mine as seen or not seen from various mountain top viewsheds. The Rossi Mine is located within the

triangle created by the direct line of sight or a straight line drawn from the top of Big Butte to Beaver (Coyote) Peak, Beaver (Coyote) Peak to Black Mountain and Black Mountain to Big Butte. As the viewshed simulations in Appendix C illustrate the Rossi Mine is within the viewshed of these mountain tops. Visual effects could be cutting-off, reducing or interfering with the line of sight to mountain tops such as Big Butte, Craig Peak, Black Mountain, and Beaver (Coyote) Peak. Another visual effect would be night lighting interfering with line of sight or ceremonies conducted at these places during the night time hours by changing the setting or diminishing the view of the sky. See Section 3.12, Visual Resources and Appendix C. Audible effects would be the increase in noise from traffic, mining operations, blasting, and exploration activities. These noises may prevent or interfere with contacting the creator or the noises and vibrations may scare away the spirits in the area. The amount of noise, noise duration, and types of noise created by the Proposed Action would be similar to the existing and currently approved mining operations. See Section 3.20, Noise.

The Hunter Spring and Velvet Canyon-Doctor's House TCPs, which were designated in 2016 are located within the indirect effects APE for the project. No direct effects would occur to these two TCPs as a result of the project. Indirect effects to these two TCPs would consist of both audible (noise) and visual (dust) effects as described earlier in this section. Whether or not noise or dust would create an effect at these two TCP is dependent upon the atmospheric conditions during the time at which the TCPs would be used. Some days the mining activities may be heard and other days the mining activities would not be heard. Some days dust may be seen at the mine site and other days no dust would be seen. Since the mine has been in operation since 1947, these effects would be the same or similar to what has occurred over the past 60 years. These effects would be minimal and temporary.

Potential Visual Effects

BLM is responsible for identifying and protecting scenic values on public lands under several provisions of FLPMA and NEPA. The BLM developed its Visual Resource Management (VRM) system to implement a systematic, interdisciplinary approach to what is inherently a somewhat subjective analysis. The VRM system includes an inventory process, based on a matrix of scenic quality, viewer sensitivity to visual change, and viewing distances, which leads to classification of public lands and assignment of visual management objectives. Four VRM classes were established, which serve two purposes: 1) as inventory tools portraying relative value of existing visual resources and 2) as management tools portraying visual management objectives for the respective classified lands. See Section 3.12, Visual Resources, for analysis of visual resources in the Rossi Mine Expansion Project vicinity.

Big Butte, Black Mountain, Beaver (Coyote) Peak, Craig Peak, Lone Mountain, Mary's Mountain, and Swales Mountain are seven mountains that are of cultural and spiritual significance to the Western Shoshone in the area, making available views from these peaks sensitive vantage points. Other major visual features of the natural landscape include the gently sloping Sheep Creek Range to the south that converges into the Tuscarora Mountain range to the east, and the Santa Renia Mountains to the west. As stated earlier mountain tops and ridgelines are important areas as these areas provide vantage points for overseeing the landscape or terrain.

Potential visual effects associated with the proposed project were determined by comparing visual contrast ratings for the proposed project facilities with the BLM's VRM class objectives for the study area (see Section 3.12, Visual Resources). The process involved comparing the degree of visual contrast from the proposed facilities and activities with the existing landscape character both during active mining and after reclamation has been completed. The VRM system does not specifically address visual effects to culturally important areas.

The visual resources viewshed analysis included analysis of Key Observation Point (KOP) 5, located on the summit of Big Butte, approximately nine air miles from the Rossi Mine, looking southeast toward the proposed project. This view is representative of culturally sensitive views from nearby peaks. This view was chosen because it is the closest peak with culturally and spiritually sensitive views to Western Shoshone that would have views of the proposed project, as identified through viewshed modeling. **Figures C1-C7 in Appendix C** depict individual viewsheds from the perspective of an observer located on the summit of each of the mountains in question (Big Butte, Black Mountain, Beaver (Coyote) Peak, Craig Peak, Swales Mountain, and Lone Mountain) looking toward or at the mine site.

Mary's Mountain, Lone Mountain, Beaver (Coyote) Peak, and Swales Mountain

Results of the visual effect analysis indicate that views of the mine from the summit of Mary's Mountain are extremely limited and not significant. The mine cannot be viewed from Lone Mountain, Beaver (Coyote) Peak, and Swales Mountain.

Big Butte, Craig Peak and Black Mountain

Development of the proposed Rossi Mine Expansion Project would further affect the visual environment of the Big Butte, Craig Peak, and Black Mountain areas. The existing King North WRDF and its expansion, the new QLC East, and the new QLC North WRDFs would be the most prominent features visible in the background from Big Butte, as shown in the simulation for KOP 5 (**Figure B-5 in Appendix B**). Big Butte is important to the Western Shoshone people for religious and ceremonial purposes. Big Butte is part of a ceremonial/spiritual landscape in current use and connected to the Tosawihi Quarries, Antelope Creek, Beaver (Coyote) Peak, Craig Peak and Black Mountain, along with trails, collecting areas, and springs used to make the spiritual journey to Big Butte. Big Butte, Black Mountain, Craig Peak and Beaver (Coyote) Peak are four very important peaks because from each of these peaks one can see the other three.

The tribes have expressed concerns about potential effects to ceremonies/vision quests conducted on top of the nearby mountain peaks. The tribes are concerned about interruptions from visual, light, and sound effects during both day and night ceremonies/vision quests. It is hard to avoid effects with timing restrictions as there is no particular time of the year that the summits are used, although the assumption is there are not any activities in the winter due to snow. On Black Mountain there are activities generally in August and September; activities generally occur on Big Butte from June through October, but these activities could occur year-round. The Western Shoshone have not stipulated when activities occur at Craig Peak, however, the assumption is the same as for Black Mountain and Big Butte. The tribes have not informed the BLM when these mountain peaks are used.

According to Western Shoshone, when conducting ceremonies at Big Butte the Rossi Mine creates an interruption to the line of sight with Beaver (Coyote) Peak and surrounding mountain tops. The experience from the top of Big Butte is already diminished due to the industrial mining occurring within view of it. Expansion of the open pits, WRDFs, ancillary facilities, light, dust and noise would further affect those experiences.

For Big Butte, which is located approximately nine air miles northwest and Black Mountain, which is located approximately fifteen air miles southwest of the Rossi Mine, in particular, it is anticipated that the spiritual and religious experience of tribal ceremonies and vision quests held on these mountaintops may be diminished as a result of the increased visual effects on the landscape associated with the development and expansion of mining facilities under the Proposed Action. An expansion of the Rossi Mine operations may affect the view from the summit and therefore, have an effect on the ceremonies. These effects would last until reclamation is complete and the mine is closed.

Craig Peak, which is located approximately 5 air miles northwest of the Rossi Mine, is visible from places within the proposed PoO boundary. Ceremonies or spiritual activities occurring at Craig Peak may be affected by the noise occurring at the Rossi Mine dependent upon weather and atmospheric conditions. The Rossi Mine would partially interfere with the visual line of sight from Craig Peak to Beaver (Coyote) Peak. Mining and exploration activities may be seen from Craig Peak dependent upon the weather and atmospheric conditions. In summary, indirect effects to the use of the mountain tops and TCPs is dependent upon atmospheric conditions at the time the use is occurring, the mines operating schedule and operational activities, road maintenance activities, the publics use of the area or season of use, livestock grazing in the area, and the other mines (i.e., Arturo, Goldstrike, etc.) operating schedules. Noise and dust in the vicinity of the mine may also be from recreationists and the public using the roads, as well as, from the ranchers herding and rounding-up cattle.

3.6.2.2 Reconfiguration Alternative

Direct and indirect effects under the Reconfiguration Alternative would be the same or similar as those described for the Proposed Action. Under the Reconfiguration Alternative the shape and height of the WRDFs would be different from the Proposed Action with changes occurring to the design of the WRDFs. Otherwise the proposed activities would be the same as described in the Proposed Action. The effects are as follows:

- Prayer Land or Praying Place [Nansuntehain Sokopin] (CRNV-12-18615) is located within the proposed PoO boundary. The northwest corner of this TCP would be affected by the construction of the proposed Dawn WRDF, and surface exploration and traffic or maintenance on the existing Boulder Valley Road. However, under the Reconfiguration Alternative the Dawn WRDF would be smaller in size and cover less of the area within this TCP. Direct effects to this TCP would be vegetation removal for the construction of the Dawn WRDF, construction of the Dawn WRDF, noise and dust from equipment and mining at Rossi and the neighboring Arturo mines, noise and dust from surface exploration, and traffic and maintenance work on the Boulder Valley Road. Within this TCP visual effects of the mining activity occurring at the Rossi Mine are limited due to the terrain or topography. Most visual effects would occur from the neighboring Arturo Mine and consist of seeing the existing open pits and WRDF. Also visible from this TCP are the old corrals, loading chute, fences, trough and cattle. Other noises at this TCP would be from cattle either roaming in the area, or being rounded up and/or released into the pastures. Indirect effects at this TCP during sunrise, sunset and night time hours would be the night lighting from the mines, which would mainly come from the Arturo, Goldstrike and North Operations Area as well as the noise from the other mines in the Carlin Trend. This TCP is not within the direct line of sight between Beaver (Coyote) Peak and Black Mountain; however, it is located slightly north of the direct line of sight and within the viewshed. This TCP is not visible when looking from Beaver (Coyote) Peak or Black Mountain. This TCP is partially visible (northeast corner) from the top of Big Butte and is also probably partially visible from Craig Peak. People working at the Arturo Mine may be able to watch or view ceremonies or prayer occurring at this TCP as well as people from the public traveling the Boulder Valley Road. Surface exploration and reclamation activities have occurred within this site in the past during the 1970's up to 2014.
- Morning Sunrise Prayer Place [Imaa Tapaito'I Nanisuntehain] (CRNV-12-18616) is located within the proposed PoO boundary. The west side of this TCP would be affected by the construction of the proposed QLC East WRDF and possibly surface exploration. Drivable access to this location would be eliminated due to the proposed WRDF location and relocation of the Boulder Valley Road. The QLC East WRDF would be slightly larger in the Reconfiguration Alternative. The east half of the TCP would remain accessible by foot. This site has overlooked the main operational area of the existing Rossi Mine since the mine began and would continue to overlook the main operational area of the mine. Therefore, the direct effects would continue to be noise and dust associated with the mining operation, and visual effects from the mining operation, including night lighting. Surface exploration and reclamation activities have occurred in the past during the 1970's up to the present. Indirect effects would be the same as the direct effects. This TCP is not within the direct line of sight between Big Butte and Beaver (Coyote) Peak; it is located slightly to the southwest. When looking at this TCP from the top of Big Butte or from Craig Peak, the west side of the TCP is partially visible. From the top of Black Mountain, a small portion of the west side of the TCP is visible and from the top of Beaver (Coyote) Peak, the TCP is not visible.
- The Monster Grave/Antelope Creek Coming In Prayer Place TCP [Tso'apittseh Nakuuk/Kwaheten Okkaikknne Yuapitch] (CRNV-12-18618) is located mostly within the proposed PoO boundary. This TCP would be affected the most by the Proposed Action, instead of the Reconfiguration Alternative. The direct and indirect effects to this TCP would occur from expanding the existing King open pit, surface exploration activities, noise from mining and exploration activities, visual effects from the mining operation and surface exploration activities, construction of the proposed road around the end of the King WRDF, and expansion and construction of the WRDFs as described in the Proposed Action. However, under this alternative the QLC North WRDF would be slightly smaller leaving more of the area on the east side of the TCP undisturbed by WRDF. Surface exploration and reclamation activities have occurred in the

past from the 1970's up to 2014 and would have the potential to occur within this TCP in the future. The direct and indirect effects would be the same as stated in the Proposed Action.

Effects to Resources outside the PoO Boundary

Effects under the Reconfiguration Alternative would be the same as those for the Proposed Action.

3.6.2.3 Livestock Fencing Alternative

Under the Livestock Fencing Alternative (Fencing Alternative), a three or four strand, wildlife friendly livestock exclusion fence would be installed around the perimeter of the PoO boundary as shown in **Figure 2-15**. Under this alternative a new fence would be constructed where fencing currently does not exist. The new fence would be tied into the existing fences. All other aspects of the Proposed Action and Reconfiguration Alternative would remain the same if the Fencing Alternative is determined to be implemented. The perimeter fence would cross the Boulder Valley Road on the southern and northern-most ends of the Rossi Mine boundary and the Antelope Creek Road to the west of the King Pit. New cattleguards would be installed across the Antelope Creek Road and Boulder Valley Road at the northernmost end of the mine boundary. Implementation of the Livestock Fencing Alternative would not increase the restrictions on access to the newly designated TCPs because cattleguards would be placed along roads and the roads would not be blocked for vehicular use except as stated in the Proposed Action. The effects to the newly designated TCPs would remain the same as described for the Proposed Action and the Reconfiguration Alternative, except for the Monster Grave/Antelope Creek Coming In Prayer Place TCP [Tso'apittseh Nakuuk/Kwaheten Okkaikknne Yuapitch] (CRNV-12-18618). This proposed fence would be placed through this TCP. With the fence in place the area inside the fence would remain under the access restrictions due to MSHA regulations and the part of the TCP located outside the fence would no longer be under the access restrictions, except at the time of blasting in the King Pit. Surface exploration activities may still limit access while drilling operations are in progress and until the drill site(s) would be reclaimed. The Prayer Land or Praying Place and Morning Sunrise Prayer Place TCPs would continue to be located within the fenced boundary. The Sage Grouse Dance Place would continue to be located mostly outside the fenced boundary and a small amount of this TCP may be placed inside the fence. The direct and indirect effects would be the same as previously stated in the Proposed Action and Reconfiguration Alternative. The fence would be removed once the mine is reclaimed and revegetation is determined successful by the BLM and NDEP.

3.6.2.4 No Action Alternative

The No Action Alternative is to continue mining and processing operations at the existing Rossi Mine under the terms of current permits and approvals as authorized by the BLM and the State of Nevada. The development of new facilities and implementation of the mining PoO that comprise the proposed project would not occur under the No Action Alternative. The No Action Alternative would include completion of the closure and reclamation of the existing mine disturbance and reclamation of the surface exploration activities under the terms of the current permits and approvals.

3.6.3 Cumulative Effects

The CESA for Native American traditional values is defined in Section 3.6.1, Affected Environment, and is shown in **Figure 3.6-1**. The past, present, and RFFAs are discussed in Section 3.2, Past, Present, and Reasonably Foreseeable Future Actions. RFFAs from mining activities are identified in **Table 3.2-1**; their locations are shown in **Figure 3.2-2**.

3.6.3.1 Proposed Action

During consultation meetings between the Western Shoshone and the BLM, tribal representatives expressed concern regarding the effects of historic and ongoing mining activities on tribal resources in the region. Project-specific issues identified by tribal representatives and analyzed for the proposed project include potential effects to springs, restriction of access to locations of traditional use, and diminished ability to practice their traditional cultural and spiritual practices. Cumulative effects are described below.

Effects to Access

Many Western Shoshone continue to practice lifeways and lifestyles not unlike that of their ancestors, in part or in whole. The cultural resources, sites, and activities discussed above all involve access routes. Continued traditional, cultural, and spiritual use depends on maintaining access to certain locations, and access limitations can cause an adverse effect. Increased public access also can add stresses (increased traffic and human occupation) to cultural sites and activities that were once relatively isolated and thus, secure.

Culturally important sites in the regional CESA include Tosawihi Quarries, Big Butte, locations in the Tuscarora Mountains (Beaver Peak), locations in the Sheep Creek Range (Black Mountain), Rock Creek, Boulder Valley, and other surrounding areas. Important resources include gathering locations for medicinal and edible plant materials, water sources, and quality hunting areas. Sites with special spiritual or cultural values for Western Shoshone, such as ceremonial locations, also are often associated with other resources.

Projects in the regional CESA typically only restrict access to the immediate project and mining operations in the vicinity of the Carlin Trend where safety or security concerns are important and Boulder Valley which is private property. Considering the extensive network of formal and informal roads on public lands in the regional CESA, it is likely that access has remained, and would remain, available to most of the culturally important sites and resource locations traditionally used by Western Shoshone, although, in some cases, access may be less direct than it originally had been or blocked by private landowners. In other cases, increased access in an area also could be beneficial to traditional practitioners. For example, increased access to areas containing traditionally used plant resources, that formerly were inaccessible, may assist the Western Shoshone in reaching these resources; however, access by the general public also would be increased.

All of the past and present actions and RFFAs in the regional CESA temporarily have resulted, or would result, in an increase in people and activity in and near project areas. It is unknown how much affect the increases have had, or would have, on Western Shoshone historic properties and resources, or to what extent the proposed project incrementally may contribute.

Effects to Spiritual and Religious Use Areas

Certain Western Shoshone have expressed concern about past, present, and future activities and their effects on spiritual and religious use areas within their ancestral lands. Use of these areas for individual Western Shoshone spiritual or religious practices has decreased over time as mining and other activities have increased in the CESA. In the past, much of the emphasis of Native American studies has been on the short-term effects to spiritual and religious use areas, and not on the larger, long-term effects imposed on these areas and their resources.

Areas of cultural importance to Native Americans include, but are not limited to, locations associated with the traditional beliefs concerning tribal origins, cultural history, or the nature of the world; locations where religious practitioners go, either in the past or in the present, to perform ceremonial activities based on traditional cultural rules of practice; ethnohistoric habitation sites; trails; and places from which plants, animals, minerals, and waters possessing healing powers or used for other subsistence purposes may be taken. Past ethnographic and ethnohistoric studies have identified several places of cultural importance to the Western Shoshone (McBride and Tiley 2016). Some of these areas are discrete locations while others may be general areas without defined boundaries. The areas identified through tribal consultation, ethnographic and ethnohistoric studies, and archival research are described above in Section 3.6.1.4, Ethnographic Analysis as it Relates Specifically to the Rossi Mine Site.

Cumulative effects to Western Shoshone places of cultural importance have occurred throughout Western Shoshone history and most likely would continue with modern human development activities, including mining, in the CESA. The addition of more development would affect the nature of Western Shoshone spiritual and religious use areas not only through visual intrusions, but through their presence within the landscape. Modern facilities could affect the function of these areas by interrupting the continuity of the ebb and flow of Western Shoshone power, renewal, and spirituality. Changes in the

landscape, including spiritual and religious use areas, could cumulatively affect the role of the landscape within tribal sacred and historical traditions, and potentially change how the tribes use the landscape.

Visual Effects

The BLM VRM system does not specifically address visual effects to culturally significant areas, such as TCPs. As a result, visual resources analyses that have been conducted for the past, present, and reasonably foreseeable actions in the regional CESA for Native American traditional values generally have not identified visual features that are considered important by Western Shoshone. However, a few key visual landmarks in the ethnographic study prepared for this EIS that are considered important by the Western Shoshone include Big Butte adjacent to the Tosawihi Quarries. The Tosawihi Quarries area also is an important landmark to Western Shoshone and, mainly, Tosawihi Shoshone. Other prominent mountain tops or rock outcrops were specifically identified. These landmarks were used by Western Shoshone as visual guides for ancient travel and hunting/trade routes or trails and continue to serve as physical expressions of Western Shoshone cultural identity. Additionally, prominent features often signify locations of certain ceremonies and observances observed by the Western Shoshone.

Very little information on specific visual effects to Native American landmarks was identified in the available EISs or EAs for the past and present actions and RFFAs in the regional CESA in Section 3.2. Concerns were expressed by Western Shoshone that mining throughout the regional CESA has degraded the environment in a variety of ways. Visual effect concerns were expressed by the Western Shoshone consultants during field trips and discussions as discussed in Section 3.6.1.4, Ethnographic Analysis as it Relates Specifically to the Rossi Mine Site. Night lighting from the mines in the northern end of the Carlin Trend creates a visual effect on ceremonies conducted at night from Big Butte, Beaver (Coyote) Mountain, and Black Mountain. Velvet Canyon-Doctor's House and Hunter Spring TCPs are probably also affected by the night lighting which diminishes or impairs the visual atmosphere.

The proposed project would modify the view from Big Butte, and Black Mountain. It would not modify view from Lone Mountain, Mary's Mountain, Beaver (Coyote) Peak, or Swales Mountain. Development of the proposed Rossi Mine Expansion Project incrementally would add to existing effects to the visual environment of the CESA. Some Western Shoshone consider Big Butte is part of a ceremonial/spiritual landscape in current use and connected to the Tosawihi Quarries, Antelope Creek, Coyote Mountain (Beaver Peak) and Black Mountain.

3.6.3.2 Reconfiguration Alternative

Cumulative effects under the Reconfiguration Alternative would be similar to cumulative effects associated with the Proposed Action.

3.6.3.3 Livestock Fencing Alternative

Cumulative effects under the Livestock Fencing Alternative would be similar to cumulative effects associated with the Proposed Action.

3.6.3.4 No Action Alternative

Cumulative effects under the No Action Alternative would be less than cumulative effects associated with the Proposed Action because the proposed project would not be constructed and effects to locations embodying traditional values would occur for a shorter period of time.

3.6.4 Potential Monitoring and Mitigation Measures

The BLM acknowledges that certain effects cannot be fully mitigated to the satisfaction of the tribes. Adverse effects to religious, spiritual, or sacred values cannot be monitored or mitigated. When possible, unavoidable adverse effects to known historic properties as well as sites of tribal importance identified within the APE would be mitigated. Since the Western Shoshone have not provided a time for use of the four TCPs, the BLM is unable to consider or impose timing restrictions on mining and exploration activities. Therefore, the BLM is declaring in this document that a significant effect may occur to the TCPs

and their use by the Western Shoshone until such time that mining and exploration activities have ceased and reclamation of areas disturbed by operations is complete. Western Shoshone representatives may work with the BLM and HES representatives to designate a time for the Western Shoshone to use parts of the entirety of any particular TCP, as appropriate in light of applicable regulations and operations, until such time that reclamation is complete and the mine is closed. The main effect would be the restriction of access for the three TCPs that are located within the proposed PoO boundary due to MSHA regulations for the protection and safety of the employees and public. Any subsurface archaeological material, including human remains, discovered during construction activities would be treated in accordance with a Historic Properties Treatment Plan (HPTP) or in accordance with the NAGPRA, as applicable. The BLM would monitor proposed disturbance and any untreated historic properties within or adjacent to the APE. The BLM may invite the interested tribes to attend a field visit to conduct monitoring of historic properties. Monitoring of historic properties, including sites of tribal importance, around areas of exploration and mining would be effective in ensuring inadvertent damage would not occur to these properties. No additional mitigation is recommended. Through discussions between the tribes, BLM and HES a suitable area outside of the restricted area from mining activities, yet suitable for the TCP use, may be designated for temporary use by the Western Shoshone until such time as mining and reclamation are complete at the mine.

As expressed to the BLM by representatives from the Battle Mountain Band, implementation of concurrent reclamation as soon as facilities or parts of facilities are no longer needed in the mining operation and exploration activities would facilitate and minimize the effects to the TCPs. The Western Shoshone people would like to see the disturbance areas reclaimed as soon as the mine no longer has a need or use for it in the operation.

3.6.5 Residual Effects

The cultural and traditional values (i.e., spiritual and religious values and uses) associated with the four TCPs designated within and adjacent to the proposed PoO boundary cannot be fully mitigated; therefore, it is anticipated that residual effects may occur to these resources. Since spiritual and religious values are intangible and personal to each individual person, it is unknown as to whether or not residual effects would occur. It is also unknown to what extent the Western Shoshone would continue or discontinue the use of designated TCPs in the future.

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3.7 Hazardous Materials and Solid Waste

3.7.1 Affected Environment

The study area for direct and indirect impacts for hazardous materials and solid waste includes the area within the proposed PoO boundary, the Boulder Valley Road which serves as the transportation route for hazardous materials and solid waste to I-80, and the section of I-80 from Elko to Battle Mountain, Nevada (**Figure 3.7-1**). The CESA for hazardous materials and solid waste encompasses the study area and mine activities along the Carlin Trend north of I-80 (**Figure 3.7-1**). The CESA extends from the Newmont Gold Quarry/South Operations Area Project in the south to the Hollister Mine in the north to include mining and mineral exploration activity in the Carlin Trend.

The affected environment for hazardous materials includes existing air, water, soil, and biological resources. These resources potentially could be affected by an accidental release of hazardous materials during transportation within the study area to and from the mine site and during storage and use of such materials within the project.

3.7.1.1 Project-related Hazardous Materials

The hazardous materials to be used for the proposed project are described in Section 2.3.9.4, Fuel, and Section 2.3.9.7, Hazardous Materials and Hazardous Waste Management, and summarized in **Table 2-6**. The major types of materials are briefly summarized below:

- Diesel fuel, gasoline, propane, lubrication oils, greases, anti-freeze, paint, and solvents used for equipment operation and maintenance;
- Ammonium nitrate and other blasting agents; and
- Waste or trash classified as hazardous waste.

Regulatory Definition of Hazardous Materials

Hazardous materials, which are defined in various ways under a number of regulatory programs, can represent potential risks to both human health and the environment when not properly managed. The term hazardous materials includes the following materials that may be utilized or disposed of in conjunction with mining operations:

- Substances covered under Occupational Safety and Health Administration (OSHA) and MSHA Hazard Communication Standards (29 CFR 1910.1200 and 30 CFR 42): The types of materials that may be used in mining activities and that would be subject to these regulations would include almost all of the materials identified above.
- Hazardous materials as defined under U.S. Department of Transportation (USDOT) regulations 49 CFR, Parts 170-177: The types of materials that may be used in mining activities and that would be subject to these regulations would include sodium cyanide, explosives, cement, fuels, some paints and coatings, and other chemical products.
- Hazardous substances as defined by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and listed in 40 CFR Table 302.4: The types of materials that may contain hazardous substances that are used in mining activities and that would be subject to these requirements would include sodium cyanide; solvents; solvent-containing materials (e.g., paints, coatings, degreasers); acids; and other chemical products.
- Hazardous waste as defined in the RCRA: Procedures in 40 CFR 262 are used to determine first whether a waste is a solid waste and thereafter whether a hazardous waste. The types of materials used in mining activities and that may be subject to these requirements could include liquid waste materials with a flash point of less than 140 degrees °F, spent solvent containing waste, corrosive liquids, and lab assay waste. Hazardous waste is regulated under Subtitle C of RCRA and pursuant to State of Nevada counterpart regulations and requirements. Any hazardous substances and extremely hazardous substances as well as petroleum products such

as gasoline, diesel, or propane, that are subject to reporting requirements if volumes on hand exceed threshold planning quantities under Sections 311 and 312 of Superfund Amendments and Reauthorization Act (SARA): the types of materials that may be used in mining activities and that may be subject to these requirements would include fuels, coolants, acids, and solvent-containing products such as paints and coatings.

- Petroleum products defined as “oil” in the Oil Pollution Act of 1990: The types of materials used in mining activities and that would be subject to these requirements include fuels, lubricants, hydraulic oil, and transmission fluids.

In conjunction with the definitions noted above, the following lists provide information regarding management requirements during transportation, storage, and use of particular hazardous chemicals, substances, or materials:

- The SARA Title III List of Lists or the Consolidated List of Chemicals Subject to Emergency Planning and Community Right-to-Know Act and Section 112(r) of the Clean Air Act; and
- The USDOT listing of hazardous materials in 49 CFR 172.101.

Certain types of materials, while they may contain potentially hazardous constituents, are specifically exempt from regulation as hazardous waste. Used oil, for example, may contain toxic metals, but would not be considered a hazardous waste unless it meets certain criteria. Other waste that might otherwise be classified as hazardous are managed as “universal waste” and are exempted from hazardous waste regulations as long as they are handled in ways specifically defined by regulation. An example of a material that could be managed as a universal waste is lead-acid batteries. As long as lead-acid batteries are recycled appropriately, requirements for hazardous waste do not apply.

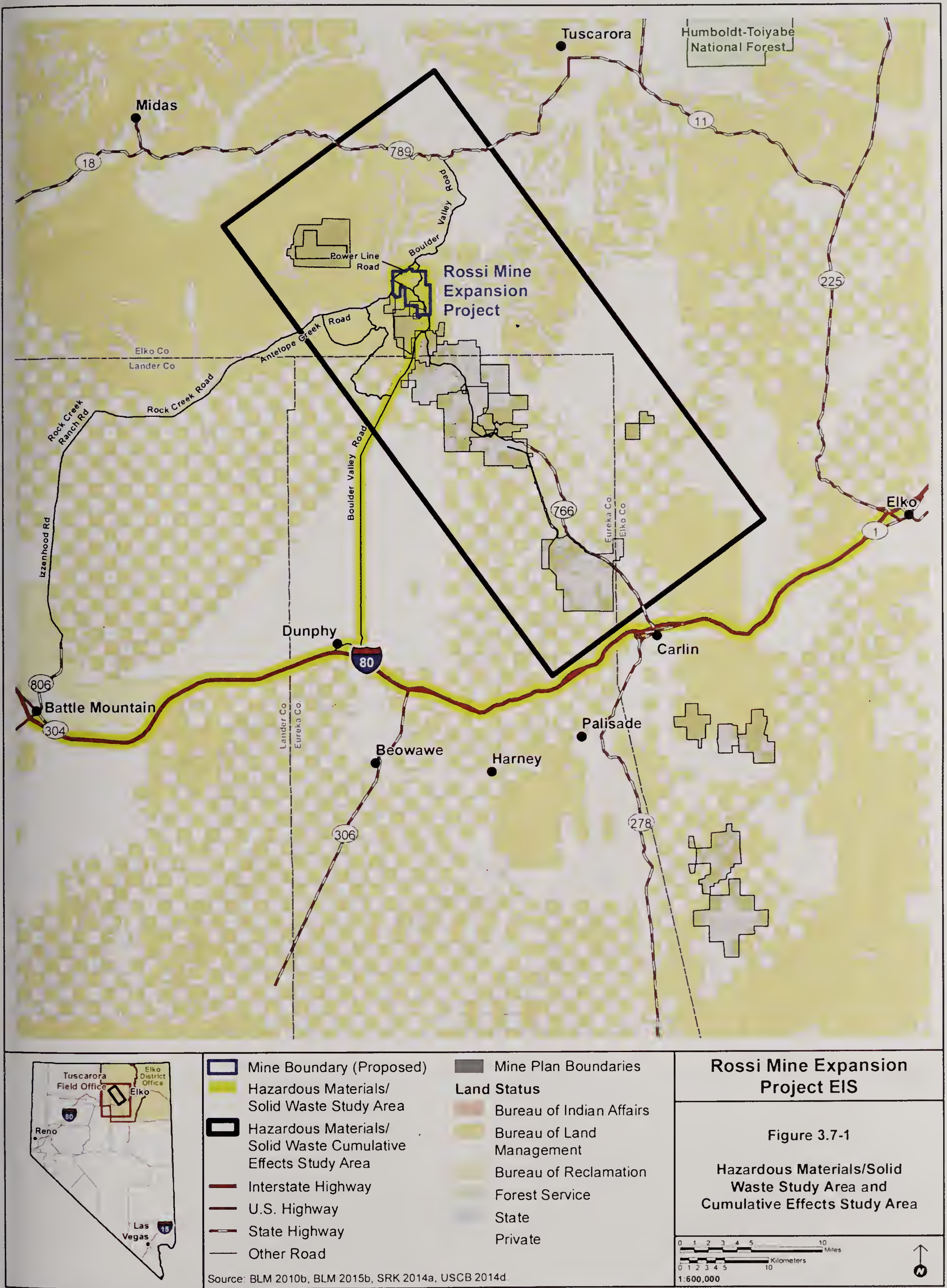
Pursuant to regulations promulgated under CERCLA, as amended by SARA, release of a reportable quantity of a hazardous substance to the environment must be reported within 24 hours to the National Response Center (40 CFR Part 302). The NAC (445A.347) also requires immediate reporting of a release of a reportable quantity of a hazardous substance to the NDEP-Bureau of Corrective Actions. In addition, under the State of Nevada WPCP program, all releases of a reportable quantity must be reported as soon as possible, but not later than 24 hours after the event, to the NDEP-Bureau of Corrective Actions; and a spill report must be provided to NDEP. Nevada regulates the storage and handling of certain defined “highly hazardous substances” under NAC 459.952-459.9542. The Nevada State Fire Marshal requires that storage of hazardous materials above certain specified thresholds obtain a permit under NAC 459.9918 (Nevada State Fire Marshal 2015).

3.7.1.2 Regulatory Definition of Solid Waste

Solid waste consists of a broad range of materials that include garbage, refuse, wastewater treatment plant sludge, non-hazardous industrial waste, and other materials (solid, liquid, or contained gaseous substances) resulting from industrial, commercial, mining, agricultural, and community activities (USEPA 2006b). Solid waste is regulated under different subtitles of the RCRA and include hazardous waste (discussed in the previous section) and non-hazardous waste. Non-hazardous waste is regulated under RCRA Subtitle D. In Nevada, solid waste rules are found in the NAC. Disposal of solid waste is regulated under NAC 444.570-444.7499; disposal of hazardous waste is regulated under NAC 444.850-444.8746.

3.7.1.3 Solid Waste Generated from Mining Operations

The solid waste associated with the proposed project may include hazardous waste, universal waste, used products, solid hazardous and non-hazardous waste, and sanitary waste. The anticipated waste types and volumes under the Proposed Action, Reconfiguration Alternative, and No Action Alternative are described in **Table 3.7-1**, below.



Rossi Mine Expansion Project EIS

Figure 3.7-1

Hazardous Materials/Solid Waste Study Area and Cumulative Effects Study Area

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notice.

Table 3.7-1. Fuels, Solid Waste, and Hazardous Materials Storage and Usage Rates for the Rossi Mine EIS

Type of Waste	Estimated Annual Quantity					
	No Action Alternative Usage (Existing Authorizations)		Proposed Action		Reconfiguration Alternative	
	Existing Storage Volume (Gallons)	*Annual Usage (Gallons)*	*Existing Storage Volume (Gallons)*	*Annual Usage (Gallons)*	*Existing Storage Volume (Gallons)*	*Annual Usage (Gallons)*
Fuels						
Diesel fuel	44,783	1,900,000	89,566	3,800,000	89,556	2,936,000
Gasoline	2,175	39,200	2,675	47,040	2,675	47,040
Kerosene	496	50	496	50	496	50
Propane	5	10	5	10	5	10
Hazardous Waste						
Aerosol can drainage	55	30	110	60	110	60
Spent solvent	600	300	900	600	900	600
Used paint	50	30	50	30	50	30
Antifreeze	900	500	1200	1000	1200	780
Universal Waste						
Fluorescent bulbs	72 bulbs	48 bulbs	72 bulbs	48 bulbs	72 bulbs	48 bulbs
Vehicle batteries	0 batteries	10 batteries	0 batteries	20 batteries	0 batteries	20 batteries
Oil Products[1]						
Motor oil	7,866	11,650	15,732	23,300	15,732	23,300
Mineral oil[2]	884	NA	1,768	NA	1,768	NA
Assorted oils[3]	2,538	10,030	5,076	20,060	5,076	20,060
Grease	710	16,383	1,420	32,766	1,420	32,766
Solid Non-hazardous Waste (cubic yards)						
Other trash/waste	125 cubic yards	350 cubic yards	125 cubic yards	455 cubic yards	125 cubic yards	455 cubic yards

Sources: SRK 2014a; HES 2016a.

[1] No used oil is delivered off site. All used oil is consumed in an oil burner.
[2] Mineral oil stored at electric transformer location. No annual usage rate.
[3] Includes gear oil, hydraulic fluids, and transmission fluids.

3.7.2 Environmental Consequences

The primary hazardous material and solid waste risks that may be associated with the proposed project include the potential for accidental releases of materials during transport to and from the project area or an un-anticipated release of materials during use or storage within the mine area.

3.7.2.1 Proposed Action

Under the Proposed Action, the transport, storage, use, and disposal of hazardous materials for mine operations would continue during the extended 8-year period of mine life. The type and frequency of hazardous material shipments would not be expected to change from the amounts provided in **Table 3.7-1**. Under the Proposed Action, combined full use would increase by approximately 98 percent in comparison to the No Action Alternative (**Table 3.7-1**). If some of the chemicals identified for use during the life of the proposed project were to enter the environment in an uncontrolled manner, there could be associated direct impacts (a spill directly affecting soil or water) or indirect effects (movement of contaminants over time through impacted media). The environmental effects of a release would depend on the substance, quantity, timing, and location of the release. The event potentially could range from a minor oil spill on the project site where cleanup equipment would be readily available, to a significant release of diesel fuel during transport or re-fueling.

Transportation

All hazardous substances would be transported by commercial carriers or vendors in accordance with the requirements of Title 49 of the CFR. Carriers would be licensed and inspected as required by NDOT and USDOT. Tanker trucks would be inspected and would have a Certificate of Compliance issued by the Nevada Motor Vehicle Division. All related permits, licenses, and certificates are the responsibility of the carrier. Title 49 of the CFR requires that all shipments of hazardous substances be properly identified and placarded. Shipping papers must be accessible and must include information describing the substance, immediate health hazards, fire and explosion risks, immediate precautions, firefighting information, procedures for handling leaks or spills, first aid measures, and emergency response actions and telephone numbers.

A large-scale release of fuel or reagents would have implications for public health and safety. The location of the release would again be the primary factor in determining its importance. A release in a populated area could have effects ranging from simple inconvenience during cleanup to potential loss of life if an explosion and fire were involved. However, the probability of a release anywhere along a transportation route is very small; the probability of a release within a populated area is smaller; and the probability of a release involving an injury or fatality is smaller still. Nationally, out of a total of 96,766 crashes involving a large truck, only 1,353 (1.3 percent) involved a large truck specifically placarded for hazardous material transport. For the state of Nevada, the total number of crashes involving large trucks placarded for hazardous materials during the 2006 to 2010 period was 24 out of a total of 2,787 crashes (0.8 percent) (NDOT 2015). The national accident rate in 1996 for all categories of hazardous materials was 0.32 per million miles (Battelle 2001). In 2014, approximately 4 percent of accidents involving large trucks in the United States included a large truck transporting hazardous materials (FMCSA 2016).

Storage and Use

HES has developed a SPCCP that describes spill prevention measures, spill response, containment, and reporting procedures for hazardous materials to be stored and used on-site including ammonium nitrate, petroleum fuels, bulk oils, and ethylene glycol (anti-freeze) (AECOM 2012a). This SPCCP has already been developed and implemented in current operations. Operations conducted in accordance with the SPCCP would ensure that impacts from spills would be minimized and the spilled materials contained and removed. Fuels and hydrocarbons used during mining and processing operations would continue to be stored in areas protected by secondary containment measures that include double-walled tanks or HDPE containment. HES would have the necessary spill containment and cleanup equipment available at the site, and personnel would be able to respond quickly.

All hazardous substances would be handled in accordance with applicable MSHA regulations (Title 30 CFR) and requirements of CERCLA as amended by SARA. The hazardous materials to be used under the proposed project would be handled as recommended on the manufacturer's Material Safety Data Sheets. Based on the facility's Applicant Committed Environmental Protection Measures and the current operational practices in place, the probability of a major release occurring at the site during the life of the proposed mine expansion is low.

Blasting material and other hazardous explosives would continue to be stored, handled, and used according to MSHA and ATF regulations in addition to other federal, state, and local statues and regulations.

Disposal

All hazardous waste generated at the mine (including any liquid lab waste that meet the hazardous waste criteria) would be used, accumulated and stored in accordance with applicable federal and state requirements and transported to licensed disposal facilities in accordance with those same requirements.

Potential Effects of a Release

The environmental effects of a release would be dependent on the material released, the quantity released, and the location of the release. Potential releases could include a small amount of diesel fuel spilled during transfer operations at the mine site or the loss of several thousand gallons of diesel fuel into a riparian drainage during transport. In general, the materials of greatest concern would be diesel fuel and spent solvents. The risk of a hazardous material release related to the Proposed Action is further reduced by the fact that the ore processing operations are based upon a water and gravity based method which does not require or produce some of the common types of hazardous materials typically generated at or related to other mines in the Carlin Trend. The release of a hazardous material or waste into a sensitive area (such as stream, wetland, or populated area) is considered to be very unlikely. Depending on the material released, the amount released, and the location of the release, an accident resulting in a release could affect soils, water, biological resources, and human health.

Response to a Release

All spills, including transportation and loading/unloading spills occurring on site, would be cleaned up as soon as possible. If a spill exceeds reportable quantities, it would be reported to the NDEP-Bureau of Corrective Actions, NDEP-BMRR, USEPA, National Response Center, BLM, and the Eureka or Elko County Emergency Response Coordinator; and a spill report would be provided to NDEP.

In the event of a release en-route to the mine site, the transportation company would be responsible for response and cleanup. Law enforcement and fire protection agencies also may be involved to initially secure the site and protect public safety. Hazardous materials transporters are required to maintain an emergency response plan which details the appropriate response, treatment, and cleanup for a material spilled onto land or into water. For example, a release of hydrochloric acid could require neutralizing the spill with lime, flushing the area with water, or removing contaminated soil. Specific procedures would be developed for fuels, acids, and other hazardous materials. Any cleanup would be followed by appropriate restoration of the disturbed area, which could include replacing removed soil, seeding the area to prevent erosion, and the return of the land to its previous use.

Exploration

Under the Proposed Action, HES would continue to conduct temporary surface disturbance for exploration activities within the project area and within the PoO boundary. Exploration activities would include construction of roads and drilling pads, surface sampling, trenching, bulk sampling, geotechnical investigation, geophysical survey, water well installation, and drilling using both reverse circulation and core drill rigs. Under the Proposed Action, an additional 67 acres of surface disturbance would result from exploration activities.

Proposed drill pads would be 80 feet by 100 feet (approximately 0.18 acre), and roads would have a 14-foot running width with MSHA-compliant berms. Multiple sumps could be excavated on or off the pad with a maximum size of 40 by 50 feet. Proposed sumps would be constructed with one end sloped to provide egress for wildlife. Sumps would be backfilled as soon as practicable.

All hazardous materials and waste generated during exploration activities would continue to be handled in accordance with applicable federal and state regulations.

3.7.2.2 Reconfiguration Alternative

Under the Reconfiguration Alternative, hazardous materials analysis would be the same as discussed under the Proposed Action. Under the Reconfiguration Alternative, combined fuel use would increase by approximately 54 percent in comparison to the No Action Alternative (**Table 3.7-1**).

3.7.2.3 Livestock Fencing Alternative

Under the Livestock Fencing Alternative, hazardous materials analysis would be the same as discussed under the Proposed Action and Reconfiguration Alternative. The fence would be removed once the mine is reclaimed and revegetation is determined successful by the BLM and NDEP.

3.7.2.4 No Action Alternative

Under the No Action Alternative, the proposed project expansion would not be developed, and the potential for release of hazardous materials as a result of the proposed project would remain the same. Although activities for the existing and authorized Rossi Mine would continue to occur, the transportation and consumption of hazardous materials and generation of solid waste would be reduced in comparison to the Proposed Action and would cease when operations are completed.

3.7.3 Cumulative Impacts

The CESA for hazardous materials and solid waste is defined in Section 3.7.1, Affected Environment, and is shown in **Figure 3.7-1**. The past, present, and RFFAs are discussed in Section 3.2, Past, Present, and Reasonably Foreseeable Future Actions. RFFAs from mining and exploration activities are identified in **Table 3.2-1** and their locations are shown in **Figure 3.2-1** and **Figure 3.2-2**. **Figure 3.2-2** also illustrates some ROW actions.

3.7.3.1 Proposed Action

The proposed project would contribute to a minor increase in the use of hazardous materials and generation of solid waste, which would be offset by the closure of some mines in the Carlin Trend area. For comparison purposes, the amount of fuel that would be used annually by the Proposed Action would be 3,847,100 gallons (**Table 3.7-1**). The most recent cumulative annual fuel consumption estimate for mining projects in the Carlin Trend was estimated to be 62,000,000 gallons (SRK 2014a). The Proposed Action would represent only a 3 percent increase in fuel consumption in the Carlin Trend. As with the No Action Alternative, there is a very low probability for potential impacts and consequently no cumulative impacts.

3.7.3.2 Reconfiguration Alternative

Under the Reconfiguration Alternative, the use of hazardous materials and generation of waste would be similar to the Proposed Action. The amount of fuel that would be used annually by the Reconfiguration Alternative would be 2,983,100 gallons, representing a 23 percent decrease in comparison to the Proposed Action (**Table 3.7-1**).

3.7.3.3 Livestock Fencing Alternative

Under the Livestock Fencing Alternative, the use of hazardous materials and generation of waste would be the same as the Proposed Action and Reconfiguration Alternative.

3.7.4 Potential Monitoring and Mitigation Measures

No additional monitoring or mitigation measures are proposed for this resource. Federal and state regulations govern the handling and remediation of releases and spills of hazardous materials and substances as well as solid and hazardous wastes.

3.7.5 Residual Impacts

Residual impacts from the use of hazardous materials under the proposed project would depend on the substance, quantity, timing, location, and response involved in the event of an accidental spill or release. Operation in accordance with the facility's SPCCP and prompt cleanup of potential spills and releases would minimize the potential of residual impacts due to accidental spills or releases of hazardous materials. Current state and federal regulations that govern the transportation, storage, use, and disposal of hazardous materials have greatly reduced the potential for residual impacts due to hazardous materials. Proper disposal of non-hazardous solid waste in permitted landfills would minimize residual effects with regard to such materials.

3.8 Air Quality

3.8.1 Affected Environment

3.8.1.1 Air Quality

Overview

The air quality assessment for the Proposed Action/project examines project-specific and cumulative impacts from emissions sources located within the project boundaries and within the region. The primary analysis area (study area) for air quality extends approximately 3 miles (5 kilometers) beyond the boundaries of the project. This is consistent with a typical application of the AERMOD dispersion model. For the assessment of cumulative impacts, the area that was analyzed for the EIS extends approximately 9 miles (15 kilometers) from the boundaries in order to include several nearby mines. This section describes the meteorological, climatological, and assumed air quality conditions of the analysis area. There is one meteorological monitoring site within the analysis area, and several additional meteorological monitoring sites within Elko County and neighboring counties. There are no air quality monitoring sites within the analysis area. Therefore data from monitoring sites located in other rural parts of Nevada are used to characterize air quality for the affected environment (ICF 2016).

The USEPA regulates air quality under the federal Clean Air Act (CAA), as amended, which is a comprehensive law that regulates air emissions from stationary and mobile sources. Air quality within the region is overseen by the NDEP-BAPC and the Bureau of Air Quality Planning [BAQP]). NDEP has primary responsibility for enforcing federal and state air quality standards and regulations in Nevada. The BLM's role in air-resource management is to ensure that BLM-authorized activities comply with applicable national and state air quality standards and that the BLM's land-use management actions support compliance with applicable air quality rules and standards.

Air pollutants addressed in this section include criteria air pollutants, hazardous air pollutants (HAP), and sulfur and nitrogen compounds that could impair visibility or contribute to atmospheric deposition. Currently, available data indicate that air quality in rural Nevada meets all national and state air quality standards, including the National Ambient Air Quality Standards (NAAQS) and the Nevada Ambient Air Quality Standards (Nevada AAQS). Due to the nature of the project which involves the disturbance of the surface area in a semi-arid climate region with occasional windy conditions, particulate matter is the primary air quality-related concern for the analysis area.

The information presented in this section is based on meteorological, emissions, and air quality data from a variety of reputable sources including:

- Western Regional Climate Center (WRCC)
- USEPA
- NDEP
- Interagency Monitoring of Protected Visual Environments (IMPROVE)
- National Atmospheric Deposition Program (NADP)
- Clean Air Status and Trends Network (CASTNet)
- Mercury Deposition Network (MDN)

The data are generally for the years 1996 to 2008 for the meteorological data and 2005 to 2014 for the air quality data, although data availability varies by category and by site within each category.

Local Climate and Meteorology

The project is located in a high desert environment characterized by arid to semiarid conditions with dry, windy conditions, limited precipitation, and large daily temperature fluctuations. The terrain in this area consists of rolling hills interspersed with buttes. A key topographic feature that influences the climate of the region is the Sierra Nevada Mountains. Nevada lies on the eastern side of this mountain range and this significantly limits the amount of precipitation that the area receives. Prevailing winds are from the west and most of the moisture from the Pacific Ocean falls on the western slopes of the Sierra Nevada Mountains. As the moist air from the Pacific Ocean ascends the western slopes the air cools and condensation and precipitation occur. As the air descends the eastern slope, it is warmed, most remaining moisture evaporates, and very little precipitation occurs.

Meteorological data are collected at a monitoring station located at the Rossi Mine (**Figure 2-1**). Data collection began in 2014. Meteorological data for 2014 are summarized in **Table 3.8-1**.

Table 3.8-1. Meteorological Data and Information for 2014 – On-Site Meteorological Station Located at the Rossi Mine

Meteorological Parameter	Measured Values
Mean annual temperature	51.1 °F
Annual precipitation	---[1]
Mean annual wind speed	6.9 miles per hour
Prevailing wind direction (direction from which the winds are blowing)	South-southeast

Source: SRK 2015a.

[1] Precipitation data collected during the winter months at the Rossi Mine meteorological station were not reliable; therefore the annual total was not reliable. For comparative purposes, the annual precipitation for the Elko WB Airport is 9.6 inches as reported in BLM 2012a.

To characterize the overall climate conditions, a longer data record is needed. The nearest long-term meteorological measurement station is in Elko, Nevada, approximately 40 air miles southeast of the project Area. A second long-term meteorological measurement station is in Winnemucca, Nevada, approximately 55 air miles west of the project area. While both long-term sites are characterized by similar temperatures as the project area, a month-by-month comparison of wind data for 2014 showed that data for the Winnemucca site better represent the primary wind directions observed at the on-site monitor for most months. Thus, meteorological data for Winnemucca are used here to describe the climate of the area.

Table 3.8-2 presents temperature, precipitation, and wind information for the National Weather Service (NWS) monitoring site measurement station in Winnemucca, Nevada. The temperature and precipitation information is based on daily ambient measurements for the period from 1996 through 2008.

Table 3.8-2. Climatological Data and Information – Winnemucca Municipal Airport Meteorological Station

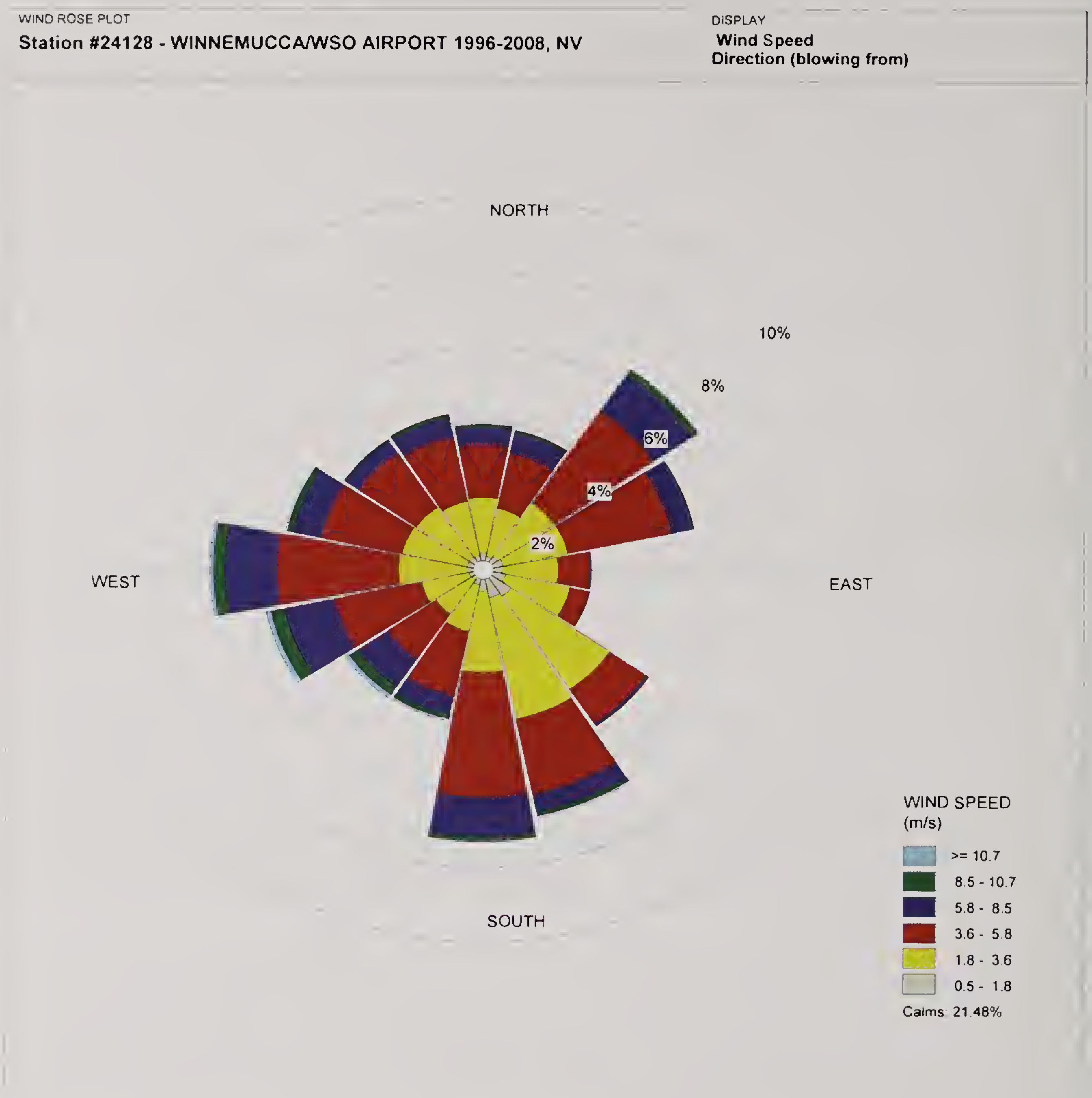
Meteorological Parameter	Measured Values
Mean annual maximum temperature	66.0 °F
Mean summer (June, July, August) maximum temperature	90.1 °F
Mean annual minimum temperature	32.6 °F
Mean winter (December, January, February) minimum temperature	20.2 °F
Mean annual temperature	49.3 °F
Annual precipitation	8.5 inches
Mean annual wind speed	6.9 miles per hour
Prevailing wind direction (direction from which the winds are blowing)	South-southeast

Source: WRCC 2008.

On average, July is the warmest month (with an average maximum temperature of 94.7 °F) and December is the coldest month (with an average minimum temperature of 18.0 °F). Average monthly precipitation is greatest in January (1.1 inches of rainfall). The average annual snowfall amount is approximately 25 inches.

Figure 3.8-1 illustrates the frequency of observed wind speed and wind direction for the Winnemucca Municipal Airport from 1996 through 2008. In the wind rose diagram, wind direction is defined as the direction from which the wind is blowing. The length of the bar within that wind-direction sector indicates the frequency of occurrence of a particular wind direction. The shading indicates the distribution of wind speeds. Observed winds are calm approximately 21 percent of the time and from the south or southeast approximately 18 percent of the time. Winds from the west and northeast are also relatively frequent, and nearly every direction is represented.

Figure 3.8-1. Distribution of Surface Wind Direction and Wind Speed for the Winnemucca Municipal Airport for 1996–2008



Sources: Lakes Environmental 2015; NOAA 2015a.

Although data for Winnemucca are used here to characterize climatic conditions within the analysis area, note that variations in elevation and topography across the region may result in variations in climatic conditions. Therefore, site-specific conditions in the project area likely vary somewhat from those reported here.

Air Quality Standards

Indicators of stress on air resources include air concentrations that exceed regulatory standards for criteria pollutants, visibility impairment, and deposition amounts that exceed critical load values for total atmospheric deposition. The sections below further describe these indicators and their relationships to regulatory thresholds and standards.

Criteria Air Pollutants

To protect human health and welfare, the Clean Air Act requires USEPA to establish NAAQS for pollutants harmful to public health or the environment. USEPA has set NAAQS for the following criteria pollutants: ozone (O_3), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), particulate matter less than 10 and 2.5 microns in diameter (PM_{10} and $PM_{2.5}$), and lead. Air-pollutant concentrations greater than the NAAQS represent a risk to human health. If the air quality in a geographic area meets

the NAAQS, it is designated an attainment area; areas that do not meet the NAAQS are designated nonattainment areas and must develop comprehensive state plans to reduce pollutant concentrations to within the NAAQS. Attainment/nonattainment status is determined separately for each criteria pollutant. The NDEP has also established Nevada AAQS, which are state-specific air quality standards for criteria pollutants. The ambient air quality standards (AAQS) for the state of Nevada are defined in the NAC 445B.22097 and generally follow the NAAQS standards.

The standards and relevant averaging periods are summarized in **Table 3.8-3**.

Table 3.8-3. Summary of Ambient Air Quality Standards for Criteria Pollutants

Pollutant (Units)	Averaging Period	NAAQS	Nevada AAQS
O_3 (ppb[9])	8-hour[1]	70	75
NO_2 (ppb)	1-hour[2]	100	100
	Annual[3]	53	53
SO_2 (ppb)	1-hour[4]	75	75
CO (ppb)	1-hour[5]	35,000	35,000
	8-hour[5]	9,000	9,000
PM_{10} ($\mu g/m^3$)	24-hour[6]	150	150
	Annual[3]	--	50
$PM_{2.5}$ ($\mu g/m^3$)	24-hour[7]	35	35
	Annual[8]	12	12

Source: USEPA 2015a.

[1] The 3-year average of the fourth-highest daily maximum 8-hour average O_3 concentration must not exceed this standard.
[2] The 3-year average of the 98th percentile of the daily maximum 1-hour average NO_2 concentration is not to exceed this standard.
[3] Not to be exceeded.
[4] The 3-year average of the 99th percentile of the daily maximum 1-hour average SO_2 concentration must not exceed this standard.
[5] Not to be exceeded more than once per year.
[6] Not to be exceeded more than once per year on average over 3 years.
[7] The 3-year average of the 98th percentile 24-hour average $PM_{2.5}$ concentration is not to exceed this standard.
[8] The 3-year average of the annual average $PM_{2.5}$ concentration is not to exceed this standard.
[9]parts per billion

The existing air quality of the study area is typical of undeveloped regions of the western United States.

There are several air quality management areas (AQMAs) in Nevada encompassing distinct geographic regions. The project is located partially within the Rock Creek Valley AQMA and partially within the Boulder Flat AQMA. Both AQMAs are designated as in attainment areas or unclassifiable (due to a lack of data) for all criteria air pollutants (SRK 2015a). Current sources of air pollutants in the region include several mines that are sources for particulate matter.

Visibility

Visibility, also referred to as visual range, is a subjective measure of the distance that light or an object can clearly be seen by an observer. Light extinction is used as a measure of visibility and is calculated from the monitored components of fine particle mass (aerosols) and relative humidity. It is expressed in terms of deciviews (dv), a measure for describing perceived changes in visibility. One deciview is defined as a change in visibility that is just perceptible to an average person, which is approximately a 10 percent change in light extinction. To estimate potential visibility impairment, monitored aerosol concentrations are used to reconstruct visibility conditions for each monitored day. The aerosol pollutant species include ammonium sulfate, ammonium nitrate, organic matter, elemental carbon, soil elements, and coarse particulate matter (with a diameter greater than 2.5 microns but less than 10 microns [PM_{10} minus $PM_{2.5}$]). The daily values are then ranked from clearest to haziest and divided into three categories to indicate the

mean visibility for all days (average), the 20 percent of days with the clearest visibility (20 percent best), and the 20 percent of days with the worst visibility (20 percent worst). Visibility over a long distance is important to visitors who come to enjoy the scenic beauty of public lands in the region.

The regional haze rule promulgated by the USEPA in 1999 requires that states establish goals (expressed in deciviews) that provide for reasonable progress toward achieving natural visibility conditions in Class I[1] areas (National Parks and Wilderness Areas) within a state. There is one Class I area in Nevada – the Jarbidge Wilderness Area, located approximately 80 air miles (130 kilometers) to the northeast of the project area, in Elko County, Nevada. There is also one sensitive Class II[2] area in Nevada – the Great Basin National Park, located approximately 185 air miles (298 kilometers) southeast of the project area in White Pine County, Nevada. Visibility within both of these areas is measured as part of the IMPROVE network.

Hazardous Air Pollutants

HAPs are pollutants that can cause serious health effects or adverse environmental or ecological effects. There is a wide variety of HAPs, including benzene, toluene, ethylbenzene, xylene (also referred to as BETEX), N-hexane, and formaldehyde. In addition, mercury is a HAP of concern. There are no federal air quality standards for HAPs.

Atmospheric Deposition

Atmospheric deposition refers to processes in which air pollutants are removed from the atmosphere and deposited into terrestrial and aquatic ecosystems. Air pollutants can be deposited by precipitation (rain and snow) or the gravitational settling of airborne pollutants on soil, water, and vegetation. Much of the concern about deposition is due to secondary formation of acids and other compounds from emitted nitrogen and sulfur pollutant species, such as nitrogen oxides (NO_x) and SO_2, which can contribute to acidification of lakes, streams, and soils and affect other ecosystem characteristics, including nutrient cycling and biological diversity.

Substances deposited include, for example:

- Acids such as sulfuric acid and nitric acid, sometimes referred to as acid rain.
- Air toxics such as pesticides, herbicides, and volatile organic compounds (VOC).
- Heavy metals such as mercury.
- Nutrients such as nitrates and ammonium.

The accurate measurement of atmospheric deposition is complicated by contributions to deposition by several components including rain, snow, cloud water, particle settling, and gaseous pollutants. Deposition varies with precipitation and other meteorological variables (e.g., temperature, humidity, winds, atmospheric stability), which, in turn, vary with elevation and over time.

Critical load values are used to quantify the amount of deposition below which significant harmful effects on specified sensitive elements of the ecosystem are not expected to occur. Current, available research data on critical load values for Class I areas in several western states suggest critical load values of 2.2 kilograms per hectare per year (kg/ha/yr) for total nitrogen deposition and 3 kg/ha/yr for total sulfur deposition (NPS 2015). However, some parts of an ecosystem are more sensitive than others and the National Park Service (NPS) has developed more detailed critical loads for specific Class I and Class II areas that vary by ecosystem type (NPS 2015). For areas where critical loads are exceeded, the quantitative assessment of deposition relative to the critical load values can guide the development of effective emission reductions. For areas where the critical loads have not been exceeded, critical loads provide a basis for ensuring that the ecosystem is protected.

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[1] *Class I air quality areas include national parks larger than 6,000 acres and Wilderness Areas larger than 5,000 acres that existed or were authorized as of August 7, 1977. They receive the highest degree of air quality protection under the Clean Air Act.*

[2] *All other parks and wilderness area are Class II areas and are of concern due to their scenic value, sensitive landscape, and location and are subject to maximum limits on air quality degradation.*

Mercury deposition is a concern for mining operations. Mercury is a naturally occurring element in many soils, volcanic rocks, and marine and geothermal water sources. Airborne mercury (Hg) is emitted from various manmade and natural sources and is composed of three forms: elemental mercury, reactive gaseous mercury, and particulate mercury.

Elemental mercury is the dominant atmospheric species and comprises about 99 percent of the total mercury in the atmosphere. It is characterized by low reactivity and low solubility in water. Elemental mercury has a long atmospheric lifetime (perhaps on the order of months to years) and is therefore dispersed and transported/circulated globally.

Reactive gaseous mercury represents less than one percent of atmospheric mercury. It is highly reactive and highly soluble. It can be actively removed from the atmosphere through both wet and dry deposition processes. As a result, the atmospheric lifetime of reactive gaseous mercury is expected to be on the order of one day to one week. Based on these properties, it likely contributes to mercury deposition near the source location (locally or regionally).

Particulate mercury also represents less than one percent of atmospheric mercury. It is moderately reactive and highly soluble in water. It is likely removed from the atmosphere primarily through wet deposition. The atmospheric lifetime of particulate mercury is estimated to be on the order of one day to one week, or longer in the absence of precipitation. Based on these properties, particulate mercury also likely contributes to mercury deposition near the source location (locally or regionally).

Airborne mercury can be transported long distances and can be directly deposited onto surface waters or deposited in forest and wetland areas and then transported through the hydrographic basin to accumulate in the surface waters. In certain bodies of water such as those with low dissolved oxygen, high organic matter content, and low acidity, mercury deposition can lead to the formation and buildup of the highly bio-accumulative form of mercury (methyl mercury). Human exposure to mercury is linked with the consumption of contaminated fish from such water bodies.

Mercury can be released to the air during mining operations. Mercury contained in ore (e.g., in minerals such as cinnabar) is a stable compound that remains in solid form. However, mercury can be released during ore processing procedures, for example by dissolving it in solutions or volatilizing it into a gas (when subjected to very high temperatures). The Nevada Mercury Control Program (NMCP) is a state regulatory program that requires mercury emissions controls on thermal units located at precious metal mines. The Rossi Mine does not have any thermal units and is not subject to the NMCP required controls. The Rossi Mine is not a precious metal mine. Barite is a locatable industrial mineral.

Air Quality and Deposition Monitoring

Monitoring Sites

There are no air quality monitoring sites within the analysis area. Therefore data from monitoring sites located in other rural parts of Nevada are used to characterize air quality for the affected environment. The nearest O_3 monitoring site is located in the Great Basin National Park and PM_{10} is measured at a monitoring site in Elko, Nevada. These data are available through USEPA's Air Quality System (AQS). $PM_{2.5}$, its component species, and visibility are monitored at two IMPROVE monitoring sites located in Jarbidge Wilderness Area (to the northeast of the project area) and Great Basin National Park (to the southeast of the area). These areas may (under certain conditions) be downwind receptors relative to the project area.

Atmospheric wet deposition of sulfate, nitrate, ammonium, and other species is measured at Great Basin National Park as part of the NADP. Atmospheric dry deposition of sulfate, nitrate, ammonium, and other species are also estimated at Great Basin National Park as part of the CASTNet. Dry deposition is not measured directly but is calculated based on the product of measured ambient concentration and a modeled deposition velocity. **Table 3.8-4** summarizes air quality and deposition data availability within the region. Finally, mercury deposition is measured through the MDN at two sites in northern Nevada (both north of the project area). Only currently operating monitoring sites are listed in the table.

Table 3.8-4. Air Quality Monitoring Sites Within the Region Encompassing the Project Area

Site Name	ID	County	Monitoring Years		Pollutants Measured	Location	
			Start	*End*		*Longitude (degrees)*	*Latitude (degrees)*
AQS							
Great Basin National Park	32-033-0101	White Pine	1988	--	O_3	39.005	-114.216
Elko	32-007-0004	Elko		--	PM_{10}	40.840	-115.768
IMPROVE							
Jarbidge Wilderness	JARB1	Elko	1988	--	Speciated $PM_{2.5}$, Visibility	41.893	-115.426
Great Basin National Park	GRBA1	White Pine	1988	--	Speciated $PM_{2.5}$, Visibility	39.005	-114.216
NADP							
Great Basin National Park	NV05	White Pine	1978	--	Wet deposition	39.005	-114.216
CASTNet							
Great Basin National Park	GRB411	White Pine	1987	--	Dry deposition	39.005	-114.216
MDN							
Gibbs Ranch	NV99	Elko	1996	--	Mercury deposition	41.571	-115.212
Lesperance Ranch	NV02	Humboldt	1996	--	Mercury deposition	41.503	-117.499

Sources: USEPA 2015b; Federal Land Managers Environmental Database 2015.

Current Conditions and Trends

Emissions

Table 3.8-5 provides anthropogenic emission totals for Elko County, Nevada, by major source category for several criteria pollutants based on the USEPA's National Emission Inventory (NEI) for 2011 (USEPA 2012 NEIv2-based platform database [2011v6.2]). This is the latest available NEI. The major emission source categories include area sources (e.g., low-level minor point sources), non-road sources (e.g., construction equipment, off-road recreational vehicles), on-road mobile sources (e.g., cars and trucks), point sources (major sources with elevated stacks), and fires (wild and prescribed fires). The fire emissions are rather large due to numerous wildfires that occurred in Elko County in 2011.

Table 3.8-5. Criteria Pollutant Inventory for 2011 (tons per year) for Elko County, Nevada

Source	NO_X	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$
Area Source	1,796	835	2,108	31	21,452	2,887
Non-road Mobile	304	572	2,701	1	39	37
On-road Mobile	3,140	1,065	12,030	12	166	95
Point Source	1,765	99	448	51	5	116
Fire	765	8,186	34,348	349	3,759	3,185
Total	**7,770**	**10,757**	**51,635**	**444**	**25,421**	**6,320**

Source: USEPA 2012.

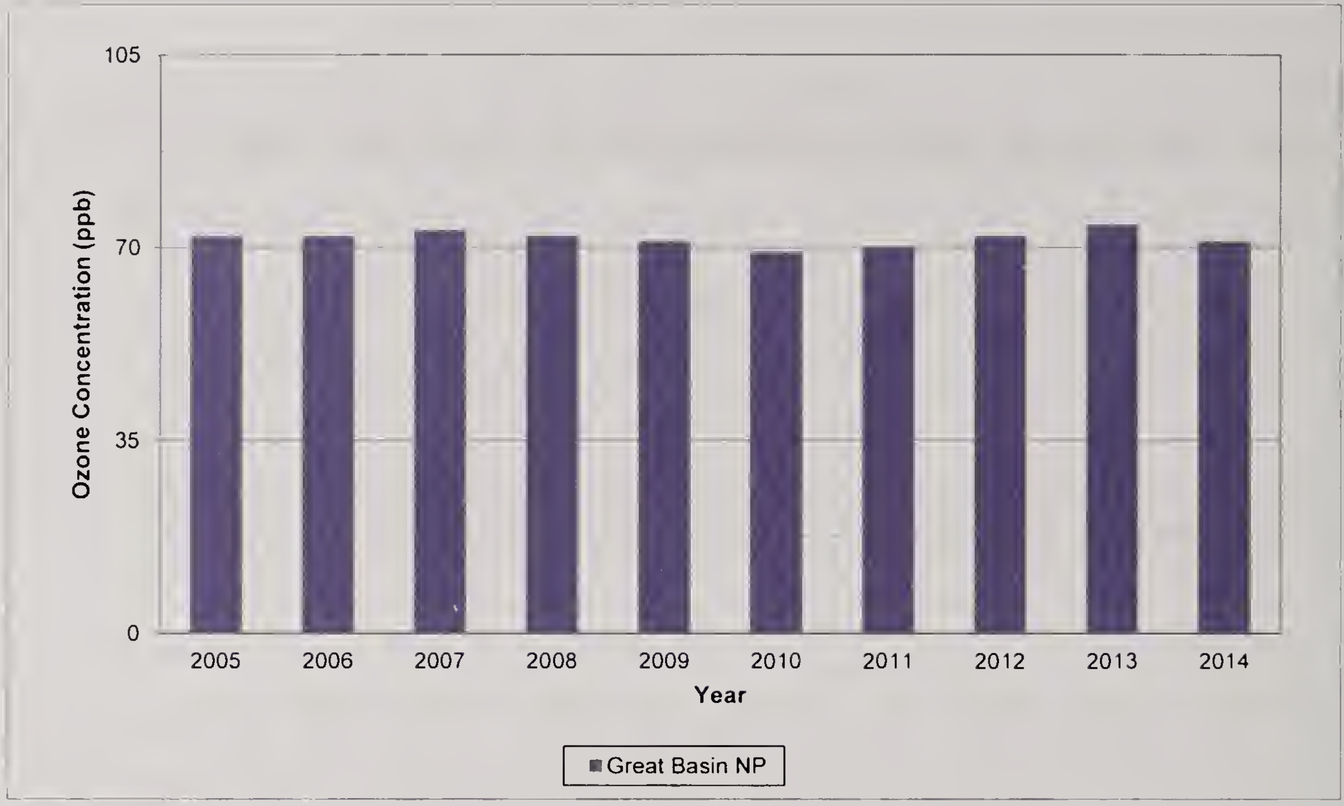
Ozone

O_3 is formed in the lower atmosphere by a series of reactions involving sunlight and precursor emissions of NO_X and VOCs. O_3 and its precursors can be transported both into and out of the analysis region. Compliance with the 8-hour O_3 NAAQS is based on the O_3 "design value," which is defined as the 3-year average of the annual fourth-highest observed 8-hour average O_3 concentration. An O_3 design value is first calculated for each monitoring site within a given area. The area-wide O_3 design value is then defined as the maximum over all sites within the area. If the design value exceeds the 8-hour O_3 NAAQS of 70 ppb, the area is designated nonattainment.

O_3 was measured for 1 year at a monitoring site located in Elko, Nevada. The fourth highest value for this site for 2014 is 60 ppb (8-hour average). O_3 is also measured at the Great Basin National Park monitoring site and these data are used to summarize O_3 concentrations and trends in rural Nevada.

Figure 3.8-2 displays the 8-hour O_3 design values for the Great Basin National Park O_3 monitoring site for 2005 to 2014. As noted earlier, the fourth-highest 8-hour average O_3 concentration for each year is used to calculate the design value and assess compliance with the O_3 NAAQS.

Figure 3.8-2. 8-Hour O_3 Design Values (ppb) for the Great Basin National Park Monitoring Site



Source: USEPA 2015a.

Note: The NAAQS for 8-hour average O_3 concentration is 70 ppb.

The design values displayed in **Figure 3.8-2** are close to the 70 ppb O_3 NAAQS for all years and indicate that the area is currently not in compliance with the O_3 NAAQS. There is no apparent trend.

Nitrogen Dioxide

NO_2 is not routinely monitored within the region. The 2008 NEI indicates that NO_2 emissions in the region are from a variety of sources. NO_2 concentrations are expected to be greatest near human-made NO_2 sources such as population centers and roadways. NO_2 is not a primary air quality concern for the region.

Sulfur Dioxide

SO_2 is not routinely monitored within the region. The 2008 NEI indicates that SO_2 emissions in the region are primarily from major and minor point sources and fires. SO_2 concentrations are expected to be greatest near industrial sources. SO_2 is not a primary air quality concern for the region.

Carbon Monoxide

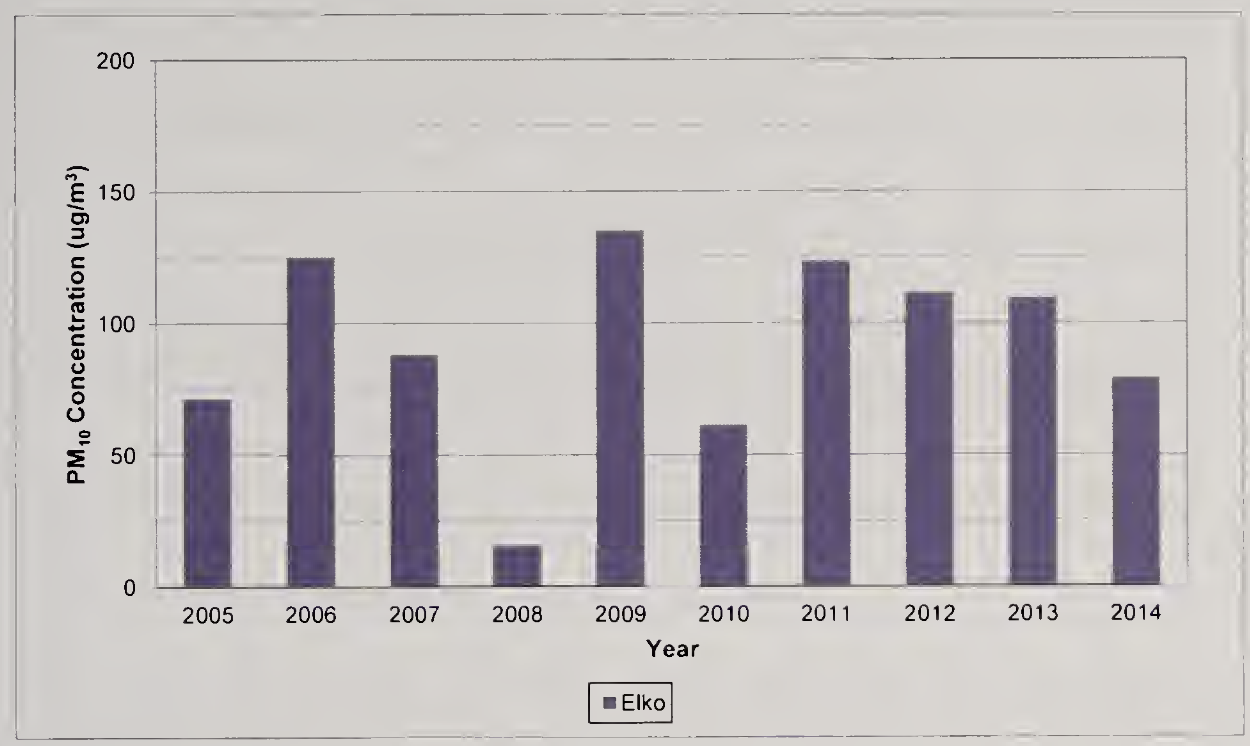
CO is not routinely monitored within the region. The 2008 NEI indicates that CO emissions in the region are primarily on-road mobile sources and fires. CO concentrations are expected to be greatest near roadways and downwind of fires. CO is not a primary air quality concern for the region.

Particulate Matter

PM_{10} and $PM_{2.5}$ are pollutants of concern within the region encompassing the project area. Based on project emissions data assembled to date, it is expected that fugitive dust sources (associated with disturbance of the ground surface) are the dominant contributors to PM_{10} and $PM_{2.5}$ concentrations. Fugitive dust is likely to occur naturally across the region, especially during high-wind events. There are several mines in the region, including the Rossi Mine, that are sources for particulate matter. At the local level, concentrations are expected to be highest near mines, unpaved roads that experience high volumes of traffic, unrelated to the Rossi Mine project, areas with depleted vegetative cover, towns and areas downwind of human-made sources of precursor emissions such as SO_2 and NO_2 that may react to form secondary $PM_{2.5}$.

PM_{10} is currently measured at a monitoring site located in Elko. Under the PM_{10} NAAQS, the maximum 24-hour average PM_{10} concentration cannot exceed 150 $\mu g/m^3$ more than once per year on average over 3 years. NDEP also requires the annual PM_{10} concentration to be less than 50 $\mu g/m^3$. **Figure 3.8-3** displays the 24-hour $PM_{2.5}$ design value for the Elko site for 2005 to 2014.

Figure 3.8-3. Maximum 24-Hour PM_{10} Design Values (μg/m3) for the Elko Monitoring Site



Source: USEPA 2015a.

Note: The NAAQS for 24-hour PM_{10} is 150 $\mu g/m^3$.

The design values are less than the PM_{10} NAAQS for all years. The data indicate no discernible trend in maximum 24-hour PM_{10}.

The NAAQS for $PM_{2.5}$ include (1) the 24-hour $PM_{2.5}$ NAAQS, which requires the 3-year average of the 98th percentile 24-hour average $PM_{2.5}$ concentration to be less than 35 $\mu g/m^3$; and (2) the annual $PM_{2.5}$ NAAQS, which requires the 3-year average of the annual average $PM_{2.5}$ concentration to be less than 12 $\mu g/m^3$.

$PM_{2.5}$ is not routinely monitored within the region. The 2008 NEI indicates that $PM_{2.5}$ emissions in the region are primarily from area sources and fires.

Visibility

The regional haze rule (40 CFR Part 51, Subpart P), promulgated by the USEPA in 1999 requires states to establish reasonable progress goals for improving visibility with the overall goal of attaining natural visibility conditions for Class I areas by 2064. **Table 3.8-6** compares visibility in deciviews for the two IMPROVE monitoring sites in Nevada for 2014 with the natural visibility conditions established by USEPA for the Jarbidge Wilderness Area. The 2014 data indicate that natural background goals are achieved for the 20 percent best days for both sites. The deciview values for the 20 percent worst days and for all days are greater than natural background.

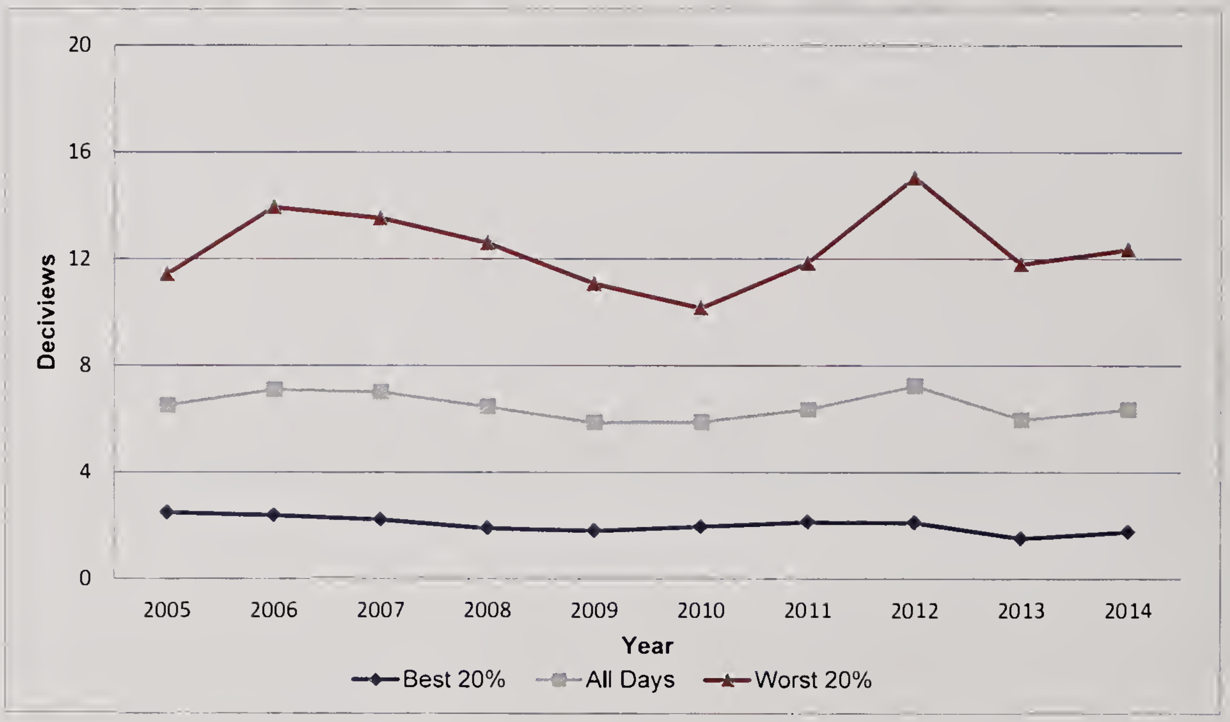
Table 3.8-6. Summary of Visibility Conditions (deciviews) for 2014 for IMPROVE Sites in Nevada Compared with Natural Visibility Conditions

Site	20% Best Days (deciviews)		20% Worst Days (deciviews)		All Days (deciviews)	
	IMPROVE	*Natural*	*IMPROVE*	*Natural*	*IMPROVE*	*Natural*
Jarbidge Wilderness (JARB1)	1.8	2.0	12.4	7.1	6.3	4.5
Great Basin National Park (GRBA1)	1.8	2.0	10.1	7.1	5.4	4.5

Sources: Federal Land Managers Environmental Database 2015; USEPA 2003.

Figure 3.8-4 and **Figure 3.8-5** display annual average visibility in deciviews for the 20 percent best days, 20 percent worst days, and all days for each year during the period from 2005 to 2014 for the Jarbidge Wilderness Area and Great Basin National Park IMPROVE sites.

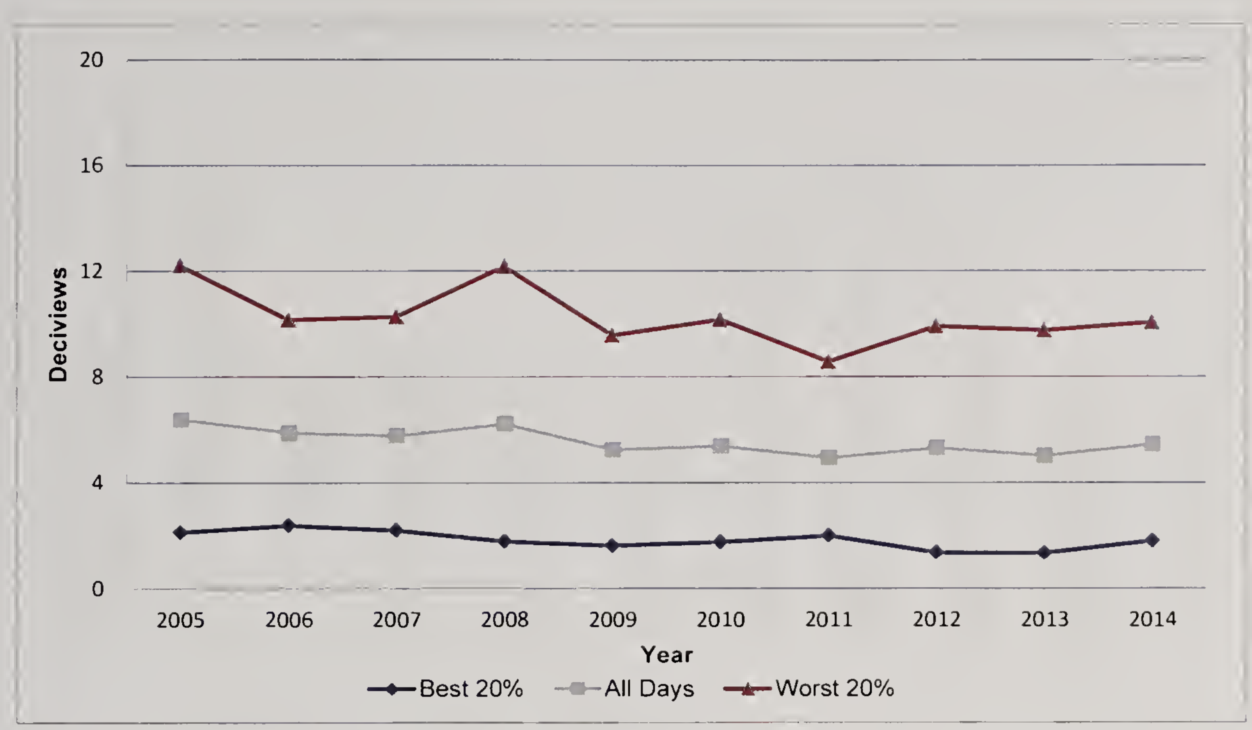
Figure 3.8-4. Annual Average Visibility (deciviews) for the Jarbidge Wilderness IMPROVE Site



Source: Federal Land Managers Environmental Database 2015.

The visibility data for Jarbidge Wilderness indicate a slight downward trend (improved visibility) for the 20 percent best days during the 2005 to 2014 period. For the other two categories of days, the data are quite variable and it is difficult to distinguish a trend. Visibility for 2012 was especially poor, compared with that of most other years, likely because of wildfires that occurred in several western states in 2012. Only the trend for the 20 percent best days is statistically significant.

Figure 3.8-5. Annual Average Visibility (deciviews) for the Great Basin National Park IMPROVE Site



Source: Federal Land Managers Environmental Database 2015.

The visibility data for Great Basin National Park indicate a slight downward trend (improved visibility) for all three categories of days. The trends for the 20% best days and for all days are statistically significant.

Hazardous Air Pollutants

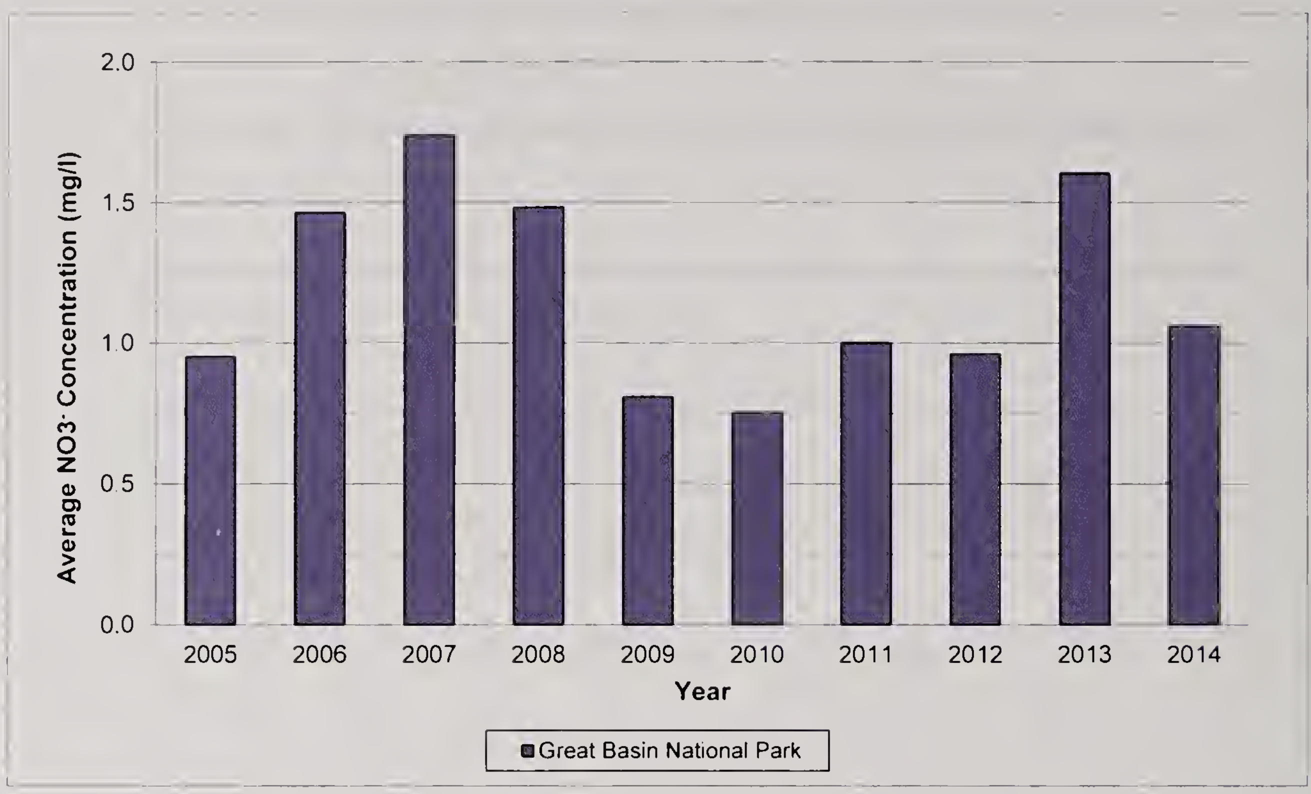
Many VOCs are HAPs and are associated with human-made sources. The latest version of the NEI (for 2011) indicates that VOC emissions within the region are primarily from area sources associated with on-road motor vehicles, area sources, and fires. As noted earlier in this section, mercury is also a HAP of concern and can be associated with mining operations such as the Rossi Mine.

Atmospheric Deposition

Atmospheric deposition of air pollutants can increase the acidity of soils and water resources. Atmospheric deposition is measured at one NADP site (wet deposition) and one CASTNet site (dry deposition) in the Great Basin National Park. Wet deposition is characterized by the concentration of nitrate ion (NO_3^-), sulfate ion (SO_4^-), and ammonium ion (NH_4^+) in precipitation samples.

Figure 3.8-6 through **Figure 3.8-8** display annual average concentration data for nitrate, sulfate, and ammonium ions from precipitation samples for each year during the period from 2005 to 2014 for the Great Basin National Park NADP sites. For each year, the data represent the average concentration based on all sampling periods. Units are milligrams per liter (mg/L).

Figure 3.8-6. Annual Average Concentration in Wet Deposition (milligrams per liter) for the NADP Monitoring Site at Great Basin National Park: Nitrate Ion Concentration

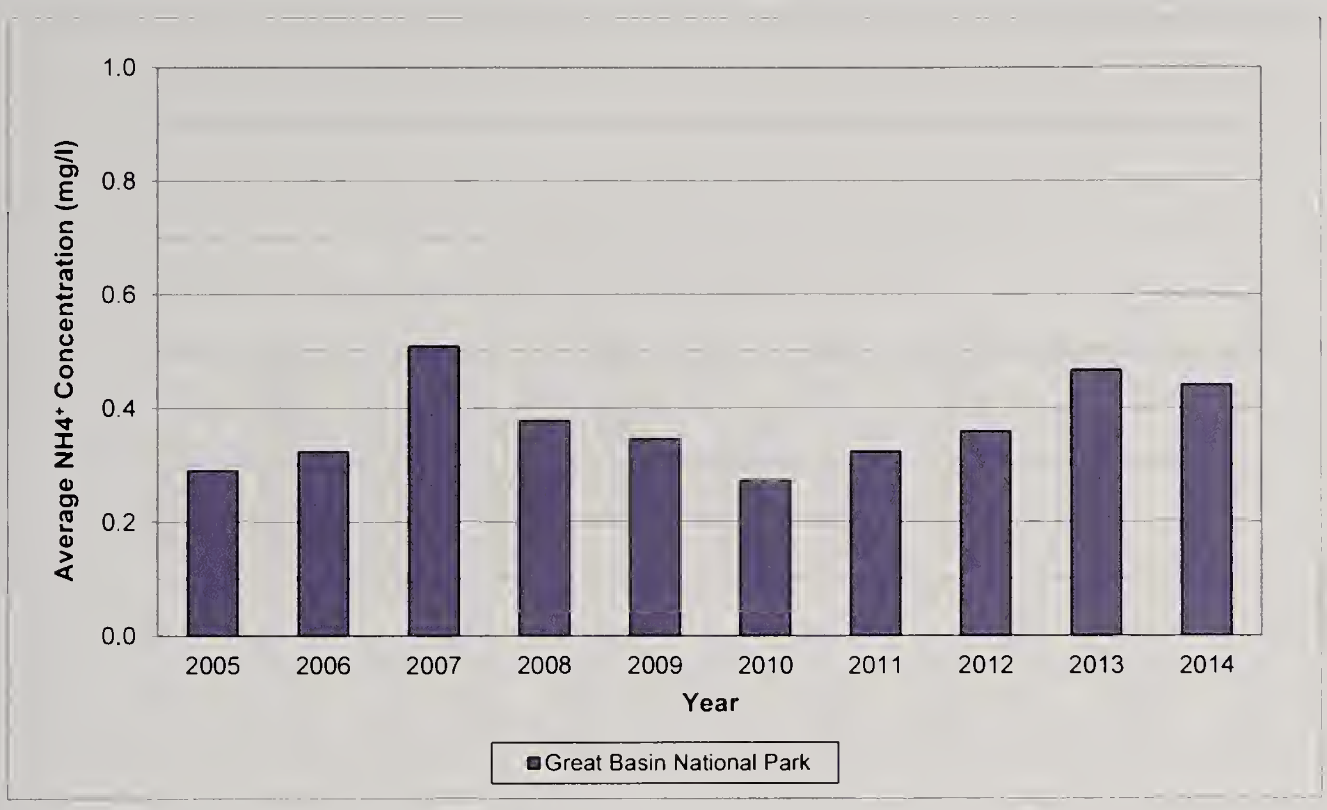


Source: Federal Land Managers Environmental Database 2015.

Figure 3.8-7. Annual Average Concentration in Wet Deposition (milligrams per liter) for the NADP Monitoring Site at Great Basin National Park: Sulfate Ion Concentration

Source: Federal Land Managers Environmental Database 2015.

Figure 3.8-8. Annual Average Concentration in Wet Deposition (milligrams per liter) for the NADP Monitoring Site at Great Basin National Park: Ammonium Ion Concentration



Source: Federal Land Managers Environmental Database 2015.

The data indicate no discernible trend in nitrate, sulfate or ammonium ions in precipitation samples during this period.

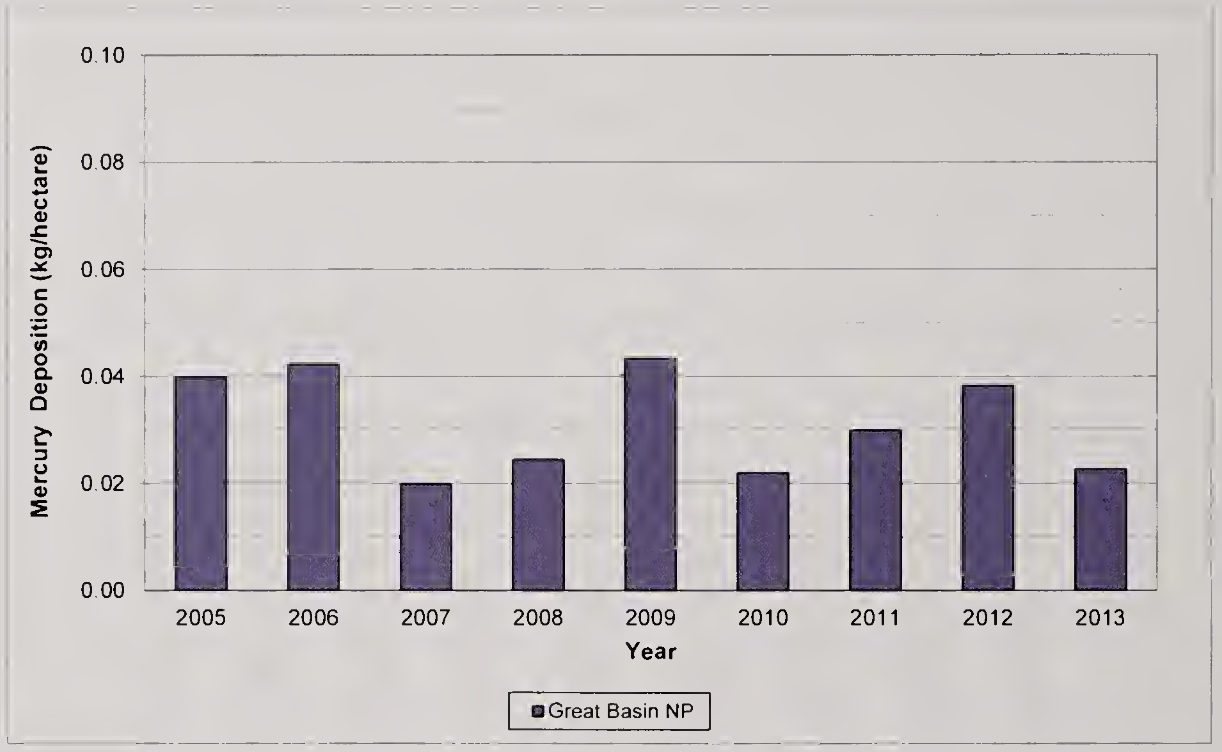
Concentration measurements for the CASTNet site in Great Basin National Park are used to estimate dry deposition. CASTNet monitoring data are only available for 2014. Average concentrations for 2014 are 0.2, 0.4, and 0.1 $\mu g/m^3$ for nitrate, sulfate, and ammonium ions, respectively.

Mercury deposition is also measured at two MDN sites in Nevada – Gibbs Ranch and Lesperance Ranch. Both sites are located to the north of the project area. Airborne mercury can be transported long distances and can be directly deposited onto surface waters or deposited in forest and wetland areas and then transported through the watershed to accumulate in the surface waters. In certain bodies of water such as those with low dissolved oxygen, high organic matter content, and low acidity, mercury deposition can lead to the formation and buildup of the highly bio-accumulative form of mercury (methyl mercury). Human exposure to mercury is linked with the consumption of contaminated fish from such water bodies. **Figure 3.8-9** and **Figure 3.8-10** display total annual mercury deposition for each year during the period from 2005 to 2013 for the MDN sites. Units are kilograms per hectare (kg/hectare).

Figure 3.8-9. Total Mercury Deposition for the MDN Monitoring Site at Gibbs Ranch, Nevada

Source: Federal Land Managers Environmental Database 2015.

Figure 3.8-10. Total Mercury Deposition for the MDN Monitoring Site at Lesperance Ranch, Nevada



Source: Federal Land Managers Environmental Database 2015.

For both monitoring sites, deposition varies from year to year, but there is no discernible trend in mercury deposition between 2005 and 2013.

3.8.2 Environmental Consequences

The Rossi Mine Expansion Project includes activities that have the potential to generate emissions of air pollutants. It includes the following proposed undertakings that may have a potential impact on air quality:

- Expansion of the King Pit
- Development of the QLC Pit

- Expansion of the King North and King South WRDFs
- Development of the QLC East, QLC North, and Dawn WRDFs
- Expansion and/or improvement of the ponds
- Expansion and development of haul roads, and secondary, exploration, and public access roads
- Additional exploration drilling
- Construction and operation of additional support facilities

3.8.2.1 Regulatory Framework and Associated Impacts

Ambient air quality and the emission of air pollutants are regulated under both federal and state of Nevada laws and regulations as discussed below. The following sections summarize the applicability of various state and federal regulations.

Federal Clean Air Act

The CAA is the primary federal legislation that addresses air quality in the United States. Under the CAA, USEPA has established NAAQS for criteria pollutants. As noted in Sec. 3.8.1, criteria pollutants are air contaminants that are commonly emitted from a variety of sources and include CO, lead, NO_2, PM_{10}, $PM_{2.5}$, O_3, and SO_2. O_3 is not directly emitted but is formed in the atmosphere through chemical reactions of O_3 precursor compounds, primarily NO_X and VOCs, in the presence of the ultraviolet component of sunlight. **Table 3.8-3** lists the NAAQS.

USEPA designates areas of the country based on compliance with the NAAQS. Designations fall under four categories as follows: “attainment” (areas in compliance with the NAAQS), “nonattainment” (areas not in compliance with the NAAQS), “maintenance” (former nonattainment areas that have achieved attainment) or “unclassifiable”. Under the CAA, each state that has a nonattainment area must prepare a State Implementation Plan (SIP), which documents how the nonattainment area would reach attainment by the required date. A SIP includes inventories of emissions within the area and establishes emission budgets (targets) and emission control programs that are designed to bring the area into compliance with the NAAQS within the schedules specified in the CAA. In maintenance areas, SIPs document how the state intends to maintain compliance with the NAAQS. Maintenance areas may be subject to more stringent regulatory requirements than attainment areas to ensure continued attainment of the NAAQS. Unclassifiable areas are treated as attainment areas for the purpose of permitting a stationary source of emissions. The project region is designated attainment or unclassifiable for all criteria pollutants.

In addition to the criteria pollutants, USEPA regulates emissions of HAPs. HAPs are chemicals that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects. USEPA currently lists 188 identified compounds as HAPs, some of which can be emitted from fuel-burning equipment in mining operations, such as benzene, butadiene, acrolein, and aldehydes. USEPA has not established ambient air quality standards for HAPs; rather USEPA regulates HAPs through emissions standards that are specific to each source type or industrial sector responsible for the emissions.

Federal Air Quality Requirements

The CAA, 42 U.S. Code 7401 et seq., as amended in 1977 and 1990, and 40 CFR Parts 50 through 99 are the basic federal statutes and regulations governing air pollution in the U.S. The following federal requirements have been reviewed for applicability to the Proposed Action:

- New Source Review (NSR)/Prevention of Significant Deterioration;
- Visibility/Regional Haze;
- Title V Operating Permits;
- New Source Performance Standards (NSPS); and
- National Emission Standards for Hazardous Air Pollutants (NESHAP).

New Source Review/Prevention of Significant Deterioration

In addition to the designations relative to the NAAQS, the CAA requires the USEPA to place areas within the United States into one of three classes, which are designed to limit the deterioration of air quality when it is “better than” the NAAQS. Class I is the most restrictive air quality category. It was created to prevent further deterioration of air quality in national parks and wilderness areas of 6,000 acres and larger, which were in existence prior to 1977, and those additional areas that have since been designated Class I under federal regulations (40 CFR 52.21). All remaining areas outside of the designated Class I boundaries were designated Class II areas, which allow a relatively greater deterioration of air quality, although still below the NAAQS. The project region is in a Class II area. No Class III areas have been designated.

The CAA defines stationary sources of emissions as “major” if their emissions exceed thresholds specified in the Act. USEPA has established separate preconstruction review procedures for major new sources of air pollution (and major modifications of major sources) for projects that are proposed to be built in attainment areas versus nonattainment areas. The preconstruction permit program for new or modified major sources located in attainment areas is called Prevention of Significant Deterioration (PSD). This review process is intended to keep new air emission sources from causing existing air quality to deteriorate beyond acceptable levels codified in the federal regulations. Construction of major new stationary sources in nonattainment areas must be reviewed in accordance with the nonattainment NSR regulations, which contain stricter thresholds and requirements.

The PSD rule defines a major stationary source as any source with a potential to emit (PTE) 100 tons per year (tons/year) or more of any criteria pollutant for source categories listed in 40 CFR §52.21(b)(1)(i) or 250 tons/year or more of any criteria pollutant for source categories that are not listed. Under PSD the maximum allowable increases in ambient pollutant concentrations are limited to incremental amounts known as “PSD increments.” The PSD increments are smallest (most restrictive) in Class I areas and largest in Class III areas. The PSD increments are triggered for an area when a PSD application for a major source or modification affecting that area has been deemed complete by the regulatory authority (40 CFR 52.21[b][14]). The closest triggered planning area (Air Pollution Control Region 61L) is located in the lower portion of the Boulder Flat area, located approximately 8 air miles to the south of the Rossi Mine. The area in which the Rossi Mine is located has not been triggered for any pollutant.

Major stationary sources or major modifications are required to notify federal land managers of Class I areas that may be affected by the emissions from the source. In addition to criteria pollutant concentrations, damage to plants and ecosystems from O_3 and $PM_{2.5}$, visibility or regional haze, and acidic deposition are of concern in Class I areas. There are no nearby Class I areas or nearby sensitive Class II areas that require an extended (long range transport) analysis for these types of impacts. The nearest Class I area to the study area is the Jarbidge Wilderness Area, located approximately 130 kilometers (80 miles) northeast of the Rossi Mine. In general, if a new major stationary source is located within 100 km (62 miles) of a Class I area, its impacts on concentrations of criteria pollutants in the Class I area must be determined and compared to the PSD increments. The Rossi Mine currently is not a major stationary source and would not be a major stationary source with the Proposed Action. Accordingly, PSD permitting and a PSD increment analysis are not required for the Proposed Action.

Visibility and Regional Haze

Visibility impacts occur when emissions absorb and scatter light in the atmosphere, causing haze and reducing the clarity of views. Regional haze impairs visibility and is produced by emissions from numerous sources located across broad geographic areas. Regional haze is made up of directly-emitted (primary) $PM_{2.5}$, and secondary $PM_{2.5}$ which is formed in the atmosphere from chemical reactions of fine particle precursors. $PM_{2.5}$ precursors include emissions of SO_2 and other sulfur oxides (SOx), NOx, ammonia, and VOCs. The most important secondary $PM_{2.5}$ particles for visibility impairment are sulfates and nitrates, which are formed from emissions of SOx and NOx, respectively. The CAA requires states to develop SIPs to address emissions that contribute to regional haze.

Visibility is measured over 24-hour periods and calculated as a percent increase in light extinction (reduced visibility) compared to a presumed pristine background. Impacts are expressed as the number of days annually that show visibility reductions of 5 percent and 10 percent calculated as reductions in

deciviews, a measure of visibility impairment. Reductions of 5 percent and 10 percent correspond to 0.5 and 1.0 deciview respectively, where 1.0 deciview represents a human perception of a just-noticeable change. Federal land management agencies often consider a change of 0.5 deciview to be potentially significant and a change of 1.0 deciview to be significant. Visibility levels also may be expressed as a standard visual range in miles during the 20 percent of days with the clearest visibility, during the 20 percent of days with the worst (haziest) visibility, and as the mean visibility for all days. These thresholds are consistent with Federal Land Managers' Air Quality Related Values Work Group guidance (FLAG 2010) as well as the USEPA Regional Haze Regulations (40 CFR Part 51.300 et seq.), which consider a 1.0 deciview change potentially significant in mandatory federal Class I areas.

The Regional Haze Rule sets goals for visibility in many national parks, wilderness areas, and international parks and provides a comprehensive visibility protection program for mandatory federal Class I areas. The visibility improvement goal stated in the rule is to ensure that in Class I areas, visibility on the worst days improves toward natural conditions, and visibility on the best days does not get worse.

Acidic deposition occurs when nitrates and sulfates formed in the atmosphere are deposited to soil, vegetation, and surface water. Federal land management agencies often apply significance thresholds of 3 kg/ha/yr of nitrogen compounds and 5 kg/ha/yr of sulfur compounds (USFS 2005). Acid deposition to lakes can impair water quality by reducing their acid-neutralizing capacity. For lake acidification, federal land management agencies often apply significance thresholds based on U.S. Forest Service guidance (USFS 2000, Fox et al. 1989). These thresholds consider a 10 percent change in acid-neutralizing capacity for lakes with a background acid-neutralizing capacity greater than 25 microequivalents per liter (µeq/l), or a 1 µeq/l change for lakes with a background acid-neutralizing capacity less than 25 µeq/l to be significant.[3] Because the Rossi Mine would not be a major stationary source with the Proposed Action (most of the emissions are from mobile sources), analysis of visibility and acid deposition impacts on Class I areas is not required for the Proposed Action.

Conformity

The USEPA General Conformity Rule (40 CFR Part 93, Subpart B) prohibits federal agencies from taking actions in nonattainment or maintenance areas that do not conform to the SIPs for those areas. In order to conform an action should not:

- Cause or contribute to new violations of the NAAQS in any area;
- Increase the frequency or severity of an existing violation of any NAAQS; or
- Delay timely attainment of any NAAQS or interim emission reductions.

The rule establishes emissions thresholds, known as *de minimis* levels, for use in evaluating the conformity of a project. If the net emission increases due to a project would be less than these thresholds, the project is presumed to conform and no further conformity evaluation is necessary. If the net emissions increases exceed any of these thresholds, a conformity determination is required. The conformity determination can entail air quality modeling studies, consultation with USEPA and state air quality agencies, and commitments to revise the SIP or to implement measures to mitigate air quality impacts. Because the Rossi Mine is located in an area that is designated attainment for all criteria pollutants, the General Conformity rule does not apply to the Proposed Action.

Title V Operating Permits

The Federal Operating Permit, or "Title V" after its section in the CAA, is a facility-wide permitting program, administered by the states under 40 CFR 70, that requires major sources with the potential to emit more than 100 tons/year of any regulated pollutant (excluding PM), 10 tons/year of any single HAP, or 25 tons/year or more of any combination of HAPs, to obtain a Title V operating permit. The Rossi Mine with the Proposed Action would not be a major stationary source and so would not be subject to the Title V operating permit program.

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[3] An equivalent is a measure of a substance's ability to combine with other substances. The equivalent is formally defined as the amount of a substance, in moles, that will react with one mole of electrons. A microequivalent is one millionth of an equivalent.

New Source Performance Standards

NSPS regulations (40 CFR Part 60) establish pollutant emission limits and monitoring, reporting, and recordkeeping requirements for various emission sources based on source type and size. These regulations apply to new, modified, or reconstructed sources. The Rossi Mine is subject to 40 CFR 60 Subpart OOO, Standards of Performance for Nonmetallic Mineral Processing Plants. This NSPS sets limits on PM emissions from crushing, grinding, and similar operations. The mine's diesel generator engines are subject to Subpart IIII, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines. This NSPS sets limits on exhaust emissions of criteria pollutants.

National Emission Standards for Hazardous Air Pollutants

The NESHAPs, codified in 40 CFR Parts 61 and 63, regulate HAP emissions. The CAA established a list of 188 HAPs and directed USEPA to publish categories of major sources and area sources of these HAPs. These standards, also known as the Maximum Achievable Control Technology (MACT) standards, were promulgated under Part 63. The 1990 CAA Amendments defines a major source of HAPs as any stationary source that has a PTE of 10 tons/year for any single HAP or 25 tons/year for all HAPs in aggregate. Levels of HAP emissions associated with the Proposed Action would be well below these thresholds, and accordingly the Rossi Mine would not be subject to the NESHAPs.

USEPA also has issued a MACT standard for mercury emissions. The Rossi Mine does not and would not process ores that contain mercury or use fuel that contains mercury. As a result, the Rossi Mine would not emit mercury and would not be subject to the mercury MACT standard.

Nevada State Air Quality Program

The NDEP-BAPC is the agency in the state of Nevada to which USEPA has delegated the responsibility for implementing a SIP (excluding Washoe and Clark counties, which have their own SIP). Included in the SIP are the State of Nevada air quality permit programs (NAC 445B.001 through 445B.3497, inclusive). The Nevada AAQS also are part of the SIP. The Nevada AAQS generally are similar to the NAAQS. In addition to establishing the Nevada AAQS, the BAPC is responsible for permit and enforcement activities throughout the state of Nevada. The BAPC permitting program implements the Title V federal operating permit program, as well as the minor source permitting program for facilities that emit less than 100 tons/year of all criteria pollutants and are not a major source of HAPs.

Under its broad statutory authority to regulate air pollution, the NDEP BAPC also has implemented a mercury control program that applies to all emission units located at precious metals mines that use direct or indirect thermal energy and have the potential to emit mercury. This program is unique to the state of Nevada and is codified at NAC 445B.3611 to NAC 445B.3689. The program's goal is to ensure that all non-de minimis[4] thermal emission units are controlled to provide the maximum degree of reduction of mercury emissions in accordance with factors given in the rule. Because the Proposed Action does not include any thermal units that emit mercury, these requirements would not apply.

The Rossi Mine currently holds BAPC air quality operating permit number AP3295-3753. This permit covers 30 emission units consisting of crushers, screens, conveyor transfers, jig feed and discharge, and diesel-fueled generator engines. Compliance with the permit is subject to several conditions including recordkeeping and reporting requirements, emissions limits, and emission test methods. The permit sets limits on emissions of CO, non-methane hydrocarbons, NOx, PM, and sulfur content of diesel fuel. The permit specifies the emission control methods to be best operating practices (no add-on controls). In addition, the permit requires that fugitive PM emissions (dust) due to land disturbance be controlled in accordance with the mine's Dust Control Plan. PM emissions due to land disturbance are to be controlled using "best practical methods."

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[4] *The Nevada BAPC de minimis levels are not related to the USEPA General Conformity de minimis thresholds.*

3.8.2.2 Methodology

The air quality analysis quantifies the expected future impacts of emissions from equipment and activities associated with the expansion of the Rossi Mine on air quality. The air quality assessment considered project-alone and cumulative near-field (within approximately 5 kilometers) air quality impacts. The modeling focused on:

- **Criteria pollutants**, including PM_{10}, $PM_{2.5}$, NO_2, SO_2, and CO. As discussed in Sections 3.8.1 and 3.8.2.1, both federal and state regulations require that ambient concentrations of these criteria pollutants not exceed applicable AAQS. Particulate matter, including dust from mining operations, wind erosion, and traffic on unpaved roads, is a criteria pollutant of particular concern for this analysis. Modeling was not performed for lead and hydrogen sulfide because emissions of these pollutants from the Rossi Mine would be negligible. Dispersion modeling was not performed for O_3 because O_3 is not emitted directly, as discussed in Section 3.8.1.
- **HAPs**, including acetaldehyde, acrolein, benzene, ethylbenzene, formaldehyde, toluene, and xylene.

The assessment focused on the project area and immediate vicinity, as discussed in more detail in the Air Quality Impact Assessment Technical Support Document (ICF 2016). The air quality analysis included the development of a project-specific emission inventory and the use of air quality dispersion modeling to assess the impacts of emissions from mining and processing activities on air quality in the study area. Detailed information on the emissions and dispersion modeling is provided in the Air Quality Impact Assessment Technical Support Document (ICF 2016). The modeling scenarios were designed to capture the maximum impacts for each pollutant for each phase of the Proposed Action. A cumulative modeling assessment also was conducted that includes emissions from the nearby Arturo, Goldstrike, and Hollister mines (see Section 3.8.3, Cumulative Impacts).

Emissions Inventory

A Proposed Action-specific emission inventory was developed for criteria pollutants, HAPs, and greenhouse gases (GHG) using information on proposed activities that would be undertaken and equipment that would be used for the proposed expansion of the Rossi Mine. The emission inventory was developed for the 8-year expansion period using information for specific equipment (e.g., generators, bulldozers, haul trucks, etc.) that combines equipment-specific emission factors with activity data (e.g., hours of operation per day, etc.) to estimate daily and annual emissions of each pollutant for each year of the Proposed Action. The emission factors for engine exhaust were obtained from the latest version of the USEPA MOVES 2014 emission factor model (USEPA 2014). Information regarding the number and type of sources, source location, stationary source parameters (e.g., height, exit temperature, exit velocity, etc.), and planned activity levels (hours per day, time of operation, etc.) were used in the emissions inventories. Fugitive dust emissions from construction and mining activities also were included. The emissions were grouped into three primary categories: construction, exploration, and mining operations. The Air Quality Impact Assessment Technical Support Document (ICF 2016) provides further information on the emissions inventory methods and data.

For the cumulative impacts analysis, emissions from other nearby mines (Arturo, Goldstrike, and Hollister mines) were estimated based on available EIS's, permits, and other literature.

Dispersion Modeling

Near-field ambient air quality impacts within the project area resulting from project-related emissions were quantified using USEPA's AERMOD model (USEPA 2004a, USEPA 2015c). AERMOD is a steady-state Gaussian dispersion model designed to simulate the local-scale dispersion of pollutants from low-level or elevated sources in simple or complex terrain. It is an USEPA "preferred" model (40 CFR Part 51, Appendix W, Guideline on Air Quality Models). Recent versions of AERMOD include algorithms for simulating deposition of gaseous and particulate pollutants. The modeling methods and results are discussed in detail in the Air Quality Impact Assessment Technical Support Document (ICF 2016).

The AERMOD modeling system consists of three main components: the AERMOD dispersion model, the AERMET meteorological data preprocessor (USEPA 2004b, USEPA 2015d), and the AERMAP terrain

preprocessor (USEPA 2004c, USEPA 2011a). The latest versions of these tools were used for this study. These include version 15181 of AERMOD, version 15181 of AERMET, and version 11103 of AERMAP. AERMOD was applied for a 5-year simulation period utilizing meteorological data from 2010 to 2014. The modeling scenarios were designed to capture the impacts for the reasonable maximum-emissions year for each pollutant for each of the major development phases of the Proposed Action: construction, exploration, and operations. AERMOD was used to examine the impacts of emissions of the following criteria pollutants: PM_{10}, $PM_{2.5}$, NO_2, SO_2 and CO. For each criteria pollutant, the averaging period(s) was based on the relevant NAAQS.

AERMOD was also used to examine the impacts of emissions of the following HAPs: acetaldehyde, acrolein, benzene, ethylbenzene, formaldehyde, toluene, and xylene. For the HAPs, the modeled concentrations were compared to inhalation unit risk (IUR) factors for carcinogens and reference concentrations (RfCs) or reference exposure levels (RELs) for non-carcinogens.

Ambient pollutant concentrations were calculated for each hour of the 2010-2014 time period, and aggregated to correspond to the relevant averaging periods defined in the AAQS for each pollutant. Both short-term (1-hour) and long-term (multi-year) exposures were considered.

For this application, AERMOD was run using regulatory default options for most simulation parameters. One exception to this is that, for NO_2, the Ozone Limiting Method (OLM) was used. Considering the conditions under which some of the highest NO_2 concentration are expected to occur (stable conditions with high NO_x and low to moderate O_3 concentrations) the OLM option was selected as better suited to simulating the ground-level NO_2 concentrations.

Within AERMOD, sources can be treated as point, volume, or area sources. For this analysis, stacks associated with the generators, as well as individual stationary facilities such as crushers and jigging facilities, were treated as point sources. Emission sources related to construction zones, roadways, and areas subject to wind erosion were treated as area or volume sources.

Digital topographical data (in the form of 7.5 minute Digital Elevation Model [DEM] files) for the analysis region were obtained from the U.S. Geological Survey and processed for use in AERMOD using the AERMAP preprocessor program (version 11103).

Meteorological inputs for AERMOD for the years 2010-2014 were developed using observed data from nearby monitoring sites: surface meteorological data from the Winnemucca, Nevada monitoring site and twice-daily upper-air data from Elko, Nevada. The meteorological inputs for AERMOD were then generated using the AERMOD Meteorological Processor (AERMET) program. AERMET requires additional information about the land-use characteristics of the area in which the surface meteorological monitoring site is located. This information was obtained using the AERSURFACE preprocessor program (version 13016) (USEPA 2013).

Geographic locations at which the model calculates concentrations are known as receptors. Grids (arrays) of receptors are used to assure that the maximum concentrations are captured. Receptors were placed along the site boundary, spaced 25 meters apart. A receptor grid of points at 100 × 100 meter spacing was placed starting at 100 m from the site boundary and extending outward to 1,000 meters. The receptor spacing was then increased to 250 × 250 meters from 1,000 meters to approximately 5,000 meters (5 kilometers) out from the site boundary. For the cumulative impact analysis (Section 3.8.3) the receptor grid was expanded to approximately 15 kilometers from the site to encompass the nearby Arturo, Goldstrike and Hollister mines.

The total pollutant concentration is the sum of the modeled impacts plus background pollutant concentrations for the region. The background concentrations were specified in accordance with NDEP guidance. **Table 3.8-7** lists the background concentrations for each pollutant.

NDEP recognizes that background concentrations are a complex issue for Nevada, where ambient monitoring is extremely sparse and typically not representative of regional-scale air quality. In the absence of local monitors, NDEP recommends the use of data from the IMPROVE monitoring network to represent background concentrations for rural Nevada. In addition, in the absence of local monitors, NDEP uses zero as the background concentration for NO_2, SO_2 and CO for NAAQS air dispersion modeling and permitting for rural areas. The rationale for this is that in many remote areas of Nevada

there are no human activities to cause background concentrations of these pollutants (which are mainly generated by anthropogenic activities) to be significantly different from zero (NDEP 2017).

The background values for PM_{10} and $PM_{2.5}$ were calculated based on data for 2012-2014 from the IMPROVE monitoring station located within the Great Basin National Park in White Pine County, Nevada. Although it is approximately 185 air miles away, this site is representative of rural Nevada (recall that data from this site were also used to estimate background ozone concentrations for input to AERMOD). The metrics were calculated consistent with the form of the standard for each pollutant and averaging period. The 24-hour PM_{10} concentration is the maximum over the 3-year period of the second-highest 24-hour average concentration. The 24-hour $PM_{2.5}$ concentration is the average over the 3-year period of the eighth highest 24-hour average concentration. The annual PM_{10} and $PM_{2.5}$ concentrations are the average over the 3-year period of the annual average concentration (based on daily, rather than hourly data). The background concentrations for CO, NO_2 and SO_2 are set to zero, since there are no measurements of these pollutants for any local monitoring sites or for any rural monitoring sites in Nevada and background concentrations are expected to be very small. NDEP does not maintain monitors for these pollutants in these remote areas. As a result Nevada is designated unclassifiable/attainment for these pollutants across the entire state (NDEP 2017). The nearest rural monitoring sites (in adjacent states) are more than 250 air miles away and are therefore not expected to be representative of the area of interest. As a permitting authority, NDEP has longstanding practice in dispersion modeling for new and modified sources within its jurisdiction. As the agency responsible for maintaining ambient air quality standards, it is reasonable to defer to NDEP's professional judgment on background concentrations.

Table 3.8-7. Background Concentrations Used in the Modeling Analysis

Pollutant	Averaging Period	Background Concentration[a] ($\mu g/m^3$)
PM_{10}[b]	24-hour	22.1
	Annual	5.4
$PM_{2.5}$[b]	24-hour	5.2
	Annual	2.5
NO_2[c]	1-hour	0
	Annual	0
SO_2[c]	1-hour	0
CO[c]	1-hour	0
	8-hour	0

[a] The metrics were calculated consistent with the form of the standard for each pollutant and averaging period. The 24-hour PM_{10} concentration is the maximum over the 3-year period of the second highest 24-hour average concentration. The 24-hour $PM_{2.5}$ concentration is the average over the 3-year period of the eighth-highest 24-hour average concentration. The annual $PM_{2.5}$ concentration is the average over the 3-year period of the annual average concentration (based on daily, rather than hourly data).
[b] The background values for PM_{10} and $PM_{2.5}$ were calculated based on data for 2012-2014 from the IMPROVE monitoring station located within the Great Basin National Park in White Pine County, Nevada.
[c] The background concentrations for CO, NO_2 and SO_2 are zero as recommended by NDEP for rural sites.

Construction

One construction related-scenario was modeled. This scenario focused on construction activities related to road construction, primarily development and rerouting of the public access road, as expected during the first year of the Proposed Action. Emissions associated with road construction include:

- Fugitive particulate emissions (PM_{10} and $PM_{2.5}$) from the disturbance of the soil during grading
- Fugitive particulate emissions from vehicle traffic during road construction
- Fugitive particulate emissions from wind erosion
- Combustion/tailpipe emissions (NOx, VOC, etc.) from heavy equipment and vehicles related to road construction
- Tailpipe emissions (NOx, VOC, etc.) from commuter vehicles related to road construction

Water well construction was also included. Emissions associated with well construction include:

- Fugitive particulate emissions (PM_{10} and $PM_{2.5}$) from the disturbance of the soil during grading
- Fugitive particulate emissions from vehicle traffic during well construction
- Fugitive particulate emissions from wind erosion
- Combustion emissions from drilling engines
- Tailpipe emissions (NO_x, VOC, etc.) from commuter vehicles related to well construction

3.8.2.3 Exploration

The exploration scenario simulated the impacts of development of access roads and pads into new portions of the project area, and the use of exploration/sampling drills. Emissions associated with exploration activities are as follows:

- Fugitive particulate emissions (PM_{10} and $PM_{2.5}$) from the disturbance of the soil during grading of access roads and pads
- Fugitive particulate emissions from vehicle traffic during construction of access roads and pads
- Fugitive particulate emissions from wind erosion
- Diesel combustion/tailpipe emissions from vehicle traffic and other equipment related to drilling
- Combustion emissions from drilling engines

A likely worst-case scenario was examined that assumed that all exploration activities would occur within the project area on a given day, but would be distributed throughout the designated exploration area.

Mining Operations

The largest sources of emissions from the operation of the Rossi Mine include the equipment, activities, and processes that run continuously 24 hours per day, seven days per week, and 365 days per year. Operational processes include blasting, hauling waste rock to the WRDFs, hauling ore to stockpiles, crushing ore, processing ore through the jig plant, and hauling/shipping to offsite locations. Mining equipment on site varies with production needs but generally includes haul trucks, front-end loaders, dozers, blast drills, motor graders, water trucks, skid steer loaders, and light vehicles. Other equipment that may be on-site on an intermittent basis would include excavators, rubber-tired backhoes, scrapers, and service vehicles. Other equipment that is used in processing the raw material includes a three-stage crusher in closed circuit with screens, the jig plant, and diesel generators used for powering various equipment.

Emissions of criteria pollutants would be produced as a result of the combustion of the fuel in the diesel generators used in running miscellaneous equipment, and for the various vehicles used in moving the raw and processed material. Fugitive particulate emissions would result from the blasting, crushing and jigging operations, as well as from wind erosion and vehicle traffic. Fugitive particulate emissions due to wind erosion for the same activities, as well as the open pit mines, were analyzed based on the sizes of the disturbed areas, durations or operations, and wind erosion factors from the USEPA AP-42 emission factor compilation (USEPA 2006a).

AERMOD was applied using the worst-case emissions for a given year during which expanded mining operations are occurring. Mining operations-related emissions include:

- Fugitive particulate emissions (PM_{10} and $PM_{2.5}$) from blasting, crushing, hauling, and jigging operations
- Fugitive particulate emissions from vehicle traffic during mining operations
- Fugitive particulate emissions from wind erosion, including from open pit mines
- Emissions from combustion of fuel in the diesel generators used in running miscellaneous equipment such as the pond pump engines
- Diesel combustion/tailpipe emissions from other operational mining equipment (including front-end loaders, dozers, blast drills, motor graders, water trucks, skid steer loaders, excavators, rubber-tired backhoes, scrapers, and service vehicles)
- Diesel combustion/tailpipe emissions from the various vehicles used in moving the raw and processed material (including hauling waste rock to the WRDFs, hauling ore to stockpiles, and hauling/shipping barite to offsite locations)
- Diesel combustion/tailpipe emissions from other vehicle traffic related to operations (including commuter vehicles)

A likely worst-case scenario was examined that assumed that the equipment, activities, and processes required for mining operations that would run continuously 24 hours per day, seven days per week, and 365 days per year. These encompass blasting, loading, hauling, crushing, and processing the ore to extract the barite concentrate.

3.8.2.4 Combination Scenario

A combination scenario including both exploration and mining operations emissions, as discussed above, was modeled to simulate a potential maximum-impact scenario. Construction was not included in the combination scenario because construction activities are expected to occur only within an approximately 20-day period. In addition, construction emissions would be small compared to emissions from exploration and mining operations.

3.8.2.5 Proposed Action

Emissions

Table 3.8-8 summarizes the estimated annual emissions of criteria pollutants with the Proposed Action. The emissions shown are for year 1, the year in which the maximum emissions are expected. Total emissions in subsequent years would be less as construction and exploration reach completion.

Table 3.8-8. Annual Criteria Pollutant Emissions (tons/year) from the Proposed Action in Year 1

Activity	VOC	NO_x	CO	SO_2	PM_{10}	$PM_{2.5}$
Construction	0.05	0.57	0.40	0.01	0.37	0.10
Exploration	1.92	6.48	30.25	2.27	13.52	3.07
Mining Operations	13.56	179.86	78.90	0.22	74.22	15.06
Total (rounded)	**15.53**	**186.91**	**109.55**	**2.50**	**88.11**	**18.23**

Table 3.8-9 summarizes the estimated annual emissions of HAPs with the Proposed Action.

Table 3.8-9. Annual HAP Emissions (tons/year) from the Proposed Action in Year 1

Activity	Acetaldehyde	Acrolein	Benzene	Formaldehyde	Toluene	Xylene
Total	0.130	0.012	0.080	0.151	0.022	0.023

Table 3.8-10 compares the estimated annual emissions of criteria pollutants and HAPs for the Proposed Action, the Reconfiguration Alternative, and the No Action Alternative.

Table 3.8-10. Annual Criteria Pollutant and HAP Emissions (tons/year) for All Alternatives in Year 1

Alternative	VOC	NO_x	CO	SO_2	PM_{10}	$PM_{2.5}$	Acet-aldehyde	Acrolein	Benzene	Form-aldehyde	Toluene	Xylene
Proposed Action	15.47	186.34	109.15	2.50	87.75	18.13	0.130	0.012	0.080	0.151	0.022	0.023
Reconfiguration Alternative	12.00	144.55	84.67	1.94	87.75	18.13	0.101	0.009	0.062	0.117	0.017	0.018
No Action Alternative	7.81	94.02	55.07	1.26	38.61	7.98	0.066	0.006	0.041	0.076	0.011	0.012

Ambient Criteria Pollutant Concentrations

Table 3.8-11 summarizes the dispersion modeling results for the construction scenario under the Proposed Action. As shown in the table, the total estimated pollutant concentration is the sum of the modeled impact plus the background concentration.

Table 3.8-11. Maximum Modeled Criteria Pollutant Impacts: Construction Scenario under the Proposed Action

Pollutant (Units)	Averaging Period	Modeled Concentration (μg/m³)	Background Concentration (μg/m³)	Total Modeled + Background Concentration (μg/m³)	NAAQS (μg/m³)	Nevada AAQS (μg/m³)	% of NAAQS/AAQS
PM_{10} (μg/m³)	24-hour	7.4	22.1	29.5	150	150	19.7
	Annual	0.6	5.4	6.0	--	50	12.0
$PM_{2.5}$ (μg/m³)	24-hour	0.7	5.2	5.9	35	35	16.9
	Annual	0.1	2.5	2.6	12	12	21.7
NO_2 (μg/m³)	1-hour	46.3	0	46.3	188	188	24.6
	Annual	0.4	0	0.4	100	100	0.4
SO_2 (μg/m³)	1-hour	8.8	0	8.8	196	196	4.5
CO (μg/m³)	1-hour	149.2	0	149.2	40,000	40,000	0.4
	8-hour	25.7	0	25.7	10,000	10,000	0.3

Table 3.8-11 shows that for the Proposed Action construction scenario, the estimated concentrations (modeled plus background values) for all criteria pollutants and time periods are lower than the NAAQS and Nevada AAQS.

Table 3.8-12 summarizes the dispersion modeling results for the exploration scenario under the Proposed Action. As shown in the table, the total estimated pollutant concentration is the sum of the modeled impact plus the background concentration.

Table 3.8-12. Maximum Modeled Criteria Pollutant Impacts: Exploration Scenario under the Proposed Action

Pollutant (Units)	Averaging Period	Modeled Concentration (μg/m³)	Background Concentration (μg/m³)	Total Modeled + Background Concentration (μg/m³)	NAAQS (μg/m³)	Nevada AAQS (μg/m³)	% of NAAQS/AAQS
PM_{10} (μg/m³)	24-hour	16.2	22.1	38.3	150	150	25.5
	Annual	0.5	5.4	5.9	--	50	11.8
$PM_{2.5}$ (μg/m³)	24-hour	1.1	5.2	6.3	35	35	18.0
	Annual	0.1	2.5	2.6	12	12	21.7
NO_2 (μg/m³)	1-hour	67.2	0	67.2	188	188	35.7
	Annual	0.4	0	0.4	100	100	0.4
SO_2 (μg/m³)	1-hour	3.2	0	3.2	196	196	16.3
CO (μg/m³)	1-hour	77.2	0	77.2	40,000	40,000	0.2
	8-hour	11.4	0	11.4	10,000	10,000	0.1

Table 3.8-12 shows that for the exploration scenario under the Proposed Action the estimated concentrations (modeled plus background values) for all criteria pollutants and time periods are lower than the NAAQS and Nevada AAQS.

Table 3.8-13 summarizes the dispersion modeling results for the mining operations scenario under the Proposed Action. As shown in the table, the total estimated pollutant concentration is the sum of the modeled impact plus the background concentration.

Table 3.8-13. Maximum Modeled Criteria Pollutant Impacts: Mining Operations Scenario under the Proposed Action

Pollutant (Units)	Averaging Period	Modeled Concentration (μg/m³)	Background Concentration (μg/m³)	Total Modeled + Background Concentration (μg/m³)	NAAQS (μg/m³)	Nevada AAQS (μg/m³)	% of NAAQS/AAQS
PM_{10} (μg/m³)	24-hour	62.4	22.1	84.5	150	150	56.3
	Annual	5.6	5.4	11.0	--	50	22.0
$PM_{2.5}$ (μg/m³)	24-hour	2.8	5.2	8.0	35	35	22.9
	Annual	0.7	2.5	3.2	12	12	26.7
NO_2 (μg/m³)	1-hour	122.8	0	122.8	188	188	65.3
	Annual	6.6	0	6.6	100	100	6.6
SO_2 (μg/m³)	1-hour	0.5	0	0.5	196	196	0.3
CO (μg/m³)	1-hour	394.3	0	394.3	40,000	40,000	1.0
	8-hour	49.3	0	49.3	10,000	10,000	0.5

Table 3.8-13 shows that for the mining operations scenario under the Proposed Action the estimated concentrations (modeled plus background values) for all criteria pollutants and time periods are lower than the NAAQS and Nevada AAQS.

Table 3.8-14 summarizes the dispersion modeling results for the combination scenario (exploration and mining operations) under the Proposed Action. As shown in the table, the total estimated pollutant concentration is the sum of the modeled impact plus the background concentration.

Table 3.8-14. Maximum Modeled Criteria Pollutant Impacts: Combination Scenario under the Proposed Action

Pollutant (Units)	Averaging Period	Modeled Concentration (μg/m³)	Background Concentration (μg/m³)	Total Modeled + Background Concentration (μg/m³)	NAAQS (μg/m³)	Nevada AAQS (μg/m³)	% of NAAQS/AAQS
PM_{10} (μg/m³)	24-hour	62.4	22.1	84.5	150	150	56.6
	Annual	5.6	5.4	11.0	--	50	22.4
$PM_{2.5}$ (μg/m³)	24-hour	2.8	5.2	8.0	35	35	23.1
	Annual	0.7	2.5	3.2	12	12	26.7
NO_2 (μg/m³)	1-hour	122.8	0	122.8	188	188	65.3
	Annual	6.6	0	6.6	100	100	6.8
SO_2 (μg/m³)	1-hour	0.5	0	0.5	196	196	1.6
CO (μg/m³)	1-hour	394.3	0	394.3	40,000	40,000	1.0
	8-hour	49.3	0	49.3	10,000	10,000	0.5

Table 3.8-14 shows that for the combination scenario under the Proposed Action the estimated concentrations (modeled plus background values) for all criteria pollutants and time periods are lower than the NAAQS and Nevada AAQS.

Ambient HAP Concentrations

AERMOD was also used to simulate airborne concentrations of HAPs, and the resulting concentrations were used to assess the risks associated with both short-term and long-term exposures to the HAPs considered: acetaldehyde, acrolein, benzene, ethylbenzene, formaldehyde, toluene and xylene.

Maximum short-term (1-hour) air toxic impacts calculated by AERMOD were compared to the acute RELs shown in **Table 3.8-14** Acute RELs are defined as concentrations at or below which no adverse health effects are expected. Since there is no established REL for ethylbenzene, the Immediately Dangerous to Life or Health (IDLH) value divided by a safety factor of 10 (IDLH/10) were used. These IDLH values are determined by the National Institute for Occupational Safety and Health and were obtained from USEPA's Air Toxics Database (USEPA 2010). **Table 3.8-15** shows that all HAP concentrations are well below the RELs or IDLH/10 values.

Table 3.8-15. Comparison of Maximum Short-Term Modeled HAP Concentrations to Impact Criteria for the Combination Scenario Under the Proposed Action

Pollutant	Modeled Concentration (mg/m^3)	REL or IDLH/10 (mg/m^3)
Acetaldehyde	3.20E-07[a]	0.47
Acrolein	3.61E-06	0.0025
Benzene	1.86E-04	1.3
Formaldehyde	9.10E-04	0.055
Toluene	6.83E-07	37
Xylene	4.76E-07	22

[a] Scientific notation: 3.20E-07 = 3.20×10^{-7} = 3.20 ten-millionths of a milligram per cubic meter.

Maximum long-term inhalation exposure to non-carcinogenic HAPs (based on annual average pollutant concentrations) was calculated for the Proposed Action using the AERMOD results and were compared to USEPA RfCs for chronic inhalation of non-carcinogenic hazardous air pollutants, as listed in **Table 3.8-16** (USEPA 2010). The RfC for a given pollutant is defined as the threshold at or below which no long-term adverse health effects are expected. **Table 3.8-16** shows that the non-carcinogenic HAP concentrations are very small and all concentrations are well below the RfC values.

Table 3.8-16. Comparison of Maximum Long-Term Modeled HAP Concentrations to Impact Criteria for the Combination Scenario under the Proposed Action

Hazardous Air Pollutant	Non-Carcinogenic HAP Impacts		Cancer Risks		
	Modeled Concentration (mg/m^3)	*RfC (mg/m^3)*	*Modeled Concentration (µg/m^3)*	*IUR (1/[µg/m^3])*	*Cancer Risk (per million)*
Acetaldehyde	2.02E-07[a]	0.009	–[b]	–	–
Acrolein	2.29E-06	0.00002	–	–	–
Benzene	1.77E-06	0.03	1.77E-03	7.80E-06	1.38E-02
Formaldehyde	4.98E-06	0.01	4.98E-03	1.30E-05	6.47E-02
Toluene	5.09E-07	5	–	–	–
Xylene	3.55E-07	0.1	–	–	–

[a] Scientific notation: 2.02E-07 = 2.02×10^{-7} = 2.02 ten-millionths of a milligram per cubic meter.
[b] Dash indicates that the pollutant is not carcinogenic.

Finally, the AERMOD results were also used to estimate the cancer risk associated with exposure to carcinogenic HAPs. To estimate the incremental inhalation cancer risk for each toxic pollutant, annual modeled concentrations were multiplied by the USEPA's IUR factors presented in **Table 3.8-16**. The IURs are estimates of the cancer risk (on a per-unit concentration basis) based on 70-year exposure to the carcinogenic HAPs. For example, an IUR of 7.8E-6 for benzene is equivalent to a cancer risk of 7.8 per million per µg/m^3. Each IUR is based on continuous exposure for 70 years. Although it is standard practice to adjust the IUR to reflect exposure time for specific receptor types, the IURs shown in **Table 3.8-15** were not adjusted, because there are no sensitive receptors within the study area (peak concentrations occurred along the boundary of the project area). Thus the results represent the maximum risk, and depending upon receptor type (were a receptor identified) the results would be lower.

The total overall cancer risk, expressed as the sum of all modeled cancer risks, is less than 0.08 per million, or much less than one per million. This value could be further adjusted for exposure, as noted above, but given the location of the peak concentrations along the boundary of project area and the overall low unadjusted value, the risks were not adjusted for exposure duration. Note that, although the overall risk is given as the sum of the risks for the HAPs, the additive effects of multiple chemicals are not fully understood.

3.8.2.6 Reconfiguration Alternative

The Reconfiguration Alternative would include modifications to the mine configuration and the sequencing of mining activities. These differences are expected to result in fewer acres of disturbance than under the Proposed Action, with less activity by earthmoving equipment and trucks. The result would be lower fuel usage and less exposed earth surface, and thus lower emissions compared to the Proposed Action, as shown in **Table 3.8-10**. The potential impacts to air quality under the Reconfiguration Alternative were not explicitly quantified as ambient concentrations but, because emissions would be lower, impacts are expected to be the same as or lower than those for the Proposed Action. As discussed above, all impacts of the Proposed Action would be within applicable standards and criteria. Consequently, all impacts of the Reconfiguration Alternative also would be within applicable standards and criteria.

3.8.2.7 Livestock Fencing Alternative

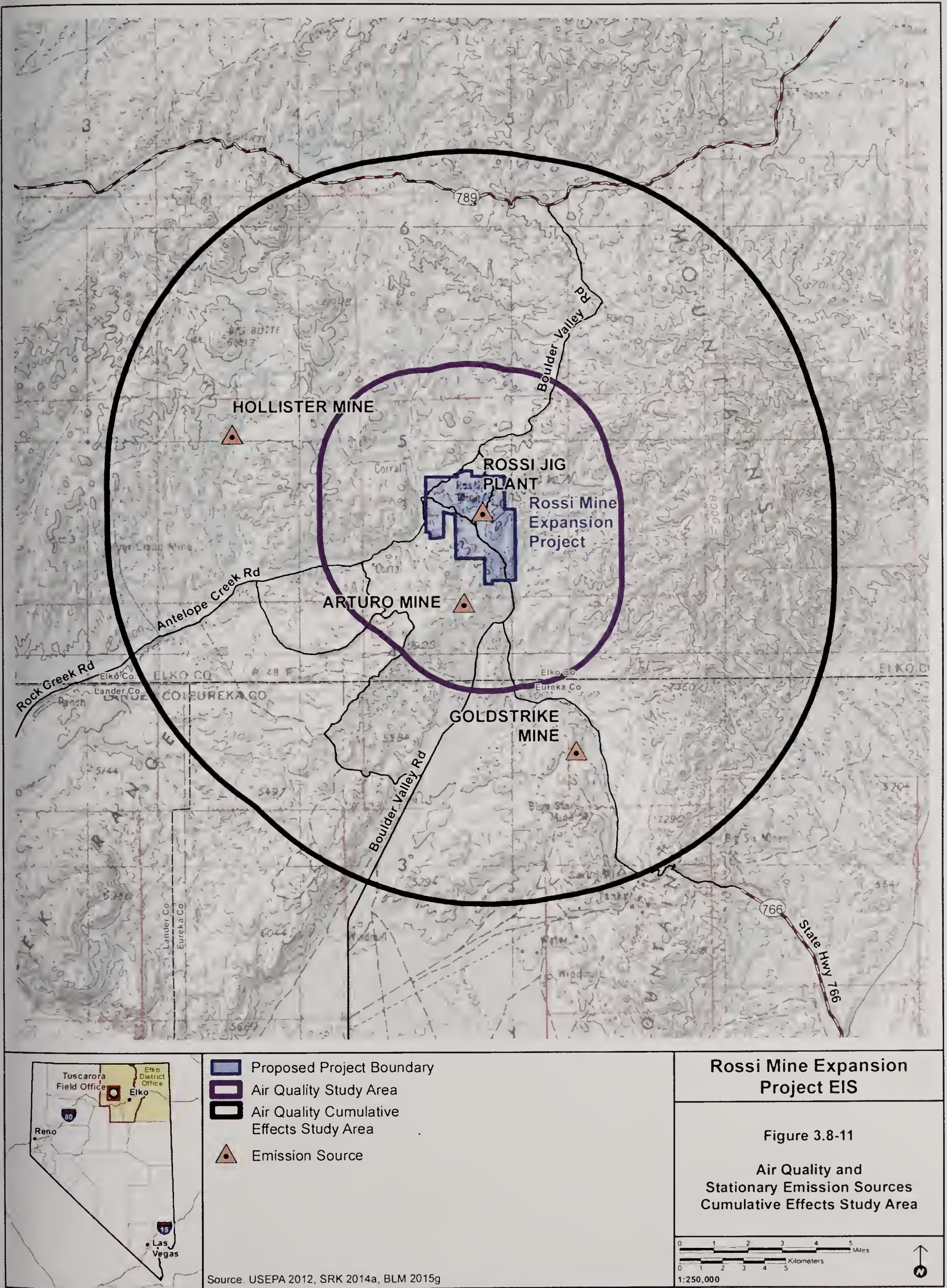
Impacts to air quality under the Fencing Alternative would be similar to impacts discussed under the Proposed Action. The fence would be removed once the mine is reclaimed and revegetation is determined successful by the BLM and NDEP.

3.8.2.8 No Action Alternative

Under the No Action Alternative, the proposed project would not be developed, and the associated air quality impacts would not occur. Continuation of mining activities associated with the current operations of the Rossi Mine, completion of closure and reclamation activities associated with existing disturbance, and ongoing mineral exploration activities within the study area, would be conducted under existing authorizations. Fugitive dust and gaseous emissions from existing mine operations that currently may affect air quality in the project area would continue.

3.8.3 Cumulative Impacts

The CESA for air quality is defined in Section 3.8.1, Affected Environment, and is shown in **Figure 3.8-1** The past, present, and RFFAs in this area are discussed in Section 3.2, Past, Present, and Reasonably Foreseeable Future Actions. RFFAs for mining and exploration activities are identified in **Table 3.2-1**; their locations are shown in **Figure 3.2-1** and **Figure 3.2-2**. **Figure 3.2-2** also illustrates ROW actions. **Figure 3.8-11** shows the mines that are relevant for air quality and that are located within the air quality CESA, consisting of the Arturo, Goldstrike, and Hollister mines.



Source. USEPA 2012, SRK 2014a, BLM 2015g

Rossi Mine Expansion Project EIS

Figure 3.8-11

Air Quality and Stationary Emission Sources Cumulative Effects Study Area

3.8.3.1 Proposed Action

Cumulative impacts to air quality would include impacts from the Proposed Action emission sources in combination with impacts from background emission sources, which reflect emissions associated with the past, present, and RFFAs. The RFFAs located within the air quality CESA are the Arturo, Goldstrike, and Hollister mines. **Table 3.8-17** shows the emissions from these mines. These sources were included in the modeling of cumulative impacts.

Table 3.8-17. Criteria Pollutant Emissions from Nearby Mines in the Air Quality CESA (tons/year)

Nearby Mines	NO_X	VOC	CO	SO_2	PM_{10}	$PM_{2.5}$
Arturo Mine						
Mine area	855.30	--	642.50	39.60	467.90	73.60
Ore Haulage	0.376	0.041	0.149	0.002	38.700	3.850
Ore Processing	0	0	0	0	0	34.68
Total Arturo	**855.68**	**0.04**	**642.65**	**39.60**	**506.60**	**112.13**
Goldstrike Mine	400.80	238.40	363.70	248.40	397.40	38.10
Hollister Mine	320.60	--	29.60	48.60	8.40	8.40
Total Cumulative Impact Sources	**1,577.08**	**238.44**	**1,035.95**	**336.60**	**912.40**	**158.63**

Sources: Arturo Mine – Enviroscientists 2011; Goldstrike Mine – NDEP 2008b; Hollister Mine – AECOM 2012b.

Table 3.8-18 presents the cumulative impact from all modeled sources for the location of the maximum impact from project-only sources. For comparison purposes, the table also provides the project-only maximum impact. The difference represents the contribution to the maximum impact from the nearby mines. The project-only concentrations presented in this table represent the maximum modeled values considering all 5 years of the 5-year modeling period.

Table 3.8-18. Maximum Modeled Criteria Pollutant Impacts: Cumulative Scenario (Cumulative Effects Study Area – Location of Project-Only Maximum)

Pollutant (Units)	Averaging Period	Project-Only Total: Modeled + Background Concentration (µg/m³)	Contribution from Nearby Mines Only (µg/m³)	Cumulative Total: Project + Mines + Background Concentration (µg/m³)	NAAQS (µg/m³)	Nevada AAQS (µg/m³)	% of NAAQS/ AAQS
PM_{10} (µg/m³)	24-hour	84.9	2.5	87.4	150	150	58.3
	Annual	11.2	1.5	12.7	--	50	25.4
$PM_{2.5}$ (µg/m³)	24-hour	8.1	0.6	8.7	35	35	24.9
	Annual	3.2	0.4	3.6	12	12	30.0
NO_2 (µg/m³)	1-hour	122.8	18.5	141.3	188	188	75.2
	Annual	6.8	6.9	13.7	100	100	13.7
SO_2 (µg/m³)	1-hour	3.2	5.8	9.0	196	196	4.6
CO (µg/m³)	1-hour	395.0	0	395.0	40,000	40,000	1.0
	8-hour	49.4	85.2	134.6	10,000	10,000	1.3

Depending upon the pollutant, the contribution from nearby mines ranges from negligible (for 1-hour CO and all four PM metrics) to larger than the project-only contribution (for annual NO_2, 1-hour SO_2, and 8-hour CO). For the locations of maximum impact from the Proposed Action, the cumulative impacts do not exceed the NAAQS and Nevada AAQS.

For most pollutant species, the emissions from the nearby Arturo, Goldstrike, and Hollister mines are greater than those for the Proposed Action. Two exceptions are for PM_{10} and $PM_{2.5}$, for which the emissions for the Rossi Mine are greater than for the Hollister Mine. Because of these larger emissions the maximum predicted concentrations anywhere within the CESA area are greater for the cumulative scenario than for the project-alone scenarios. There are modeled exceedances of the AAQS for 1-hour NO_2 (5-year average) and 24-hour PM_{10} (in 1 year only) that occur primarily to the west of the Arturo Mine and between the Arturo and Goldstrike Mines.

In order to compare the cumulative scenario results to the NAAQS, 5-year averages of all pollutants were calculated for each receptor location (paired in space). The values to be averaged were derived using the same calculation by which compliance with the standard is defined. Use of 5-year averages is consistent with USEPA modeling guidance (USEPA 2011b). **Table 3.8-19** compares the 5-year averages to the NAAQS and Nevada AAQS. Modeled violations of the standards (based on the 5-year averages) are highlighted in bold.

Table 3.8-19. Maximum Modeled Criteria Pollutant Impacts: Cumulative Scenario (Cumulative Effects Study Area – Location of Maximum 5-Year Average Values)

Pollutant (Units)	Averaging Period	Project-Only Total: Modeled + Background Concentration ($\mu g/m^3$)	Contribution from Nearby Mines Only ($\mu g/m^3$)	Cumulative Total: Project + Mines + Background Concentration ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	Nevada AAQS ($\mu g/m^3$)	% of NAAQS/ AAQS
PM_{10} ($\mu g/m^3$)	24-hour	28.7	119.0	147.7	150	150	98.5
	Annual	5.9	21.2	27.1	–	50	54.2
$PM_{2.5}$ ($\mu g/m^3$)	24-hour	5.7	12.5	18.2	35	35	52.0
	Annual	2.6	3.3	5.9	12	12	49.2
NO_2 ($\mu g/m^3$)	1-hour	42.7	**201.9**	**244.6**	188	188	130.1
	Annual	0.8	23.4	24.2	100	100	24.2
SO_2 ($\mu g/m^3$)	1-hour	0.4	87.9	88.3	196	196	45.1
CO ($\mu g/m^3$)	1-hour	58.5	845.4	903.9	40,000	40,000	2.3
	8-hour	10.9	261.1	272.0	10,000	10,000	2.7

Modeled violations of a standard are shown in **bold**.

For all metrics, the majority contribution to the maximum value is attributable to the nearby Arturo, Goldstrike, and/or Hollister mines. The contribution from emissions from the Proposed Action is relatively small. For two metrics (24-hour PM_{10} and 1-hour NO_2), the cumulative values are near or above the NAAQS.

The maximum value of the 5-year average maximum 24-hour PM_{10} concentration (modeled plus background) is 147.7 $\mu g/m^3$, which is close to the NAAQS of 150 $\mu g/m^3$. This value occurs 200 meters to the west of western boundary of the Arturo Mine. The contribution from the Proposed Action to this 5-year average value is 6.6 $\mu g/m^3$ (i.e., 28.7 $\mu g/m^3$ minus the background concentration of 22.1 $\mu g/m^3$) or approximately four percent.

The maximum value of the 5-year average daily maximum 1-hour NO_2 concentration (modeled plus background) is 244.7 $\mu g/m^3$ which exceeds the NAAQS of 188 $\mu g/m^3$. This value also occurs 200 meters to the west of western boundary of the Arturo Mine. The contribution from the Proposed Action (plus the background value) to the 5-year average value is 42.7 $\mu g/m^3$ or approximately 17 percent of the total concentration. The modeled plus background values for the nearby mines only (201.9 $\mu g/m^3$) is above the NAAQS even without the contribution from the Rossi Mine. This indicates that the potential contribution of the Rossi Mine to the cumulative modeled violation of the 1-hour NAAQS for NO_2 is small.

For the remaining pollutants and averaging periods, the cumulative impacts do not exceed the NAAQS and Nevada AAQS.

The cumulative impacts analysis indicates that:

- For the locations of maximum impact from emissions associated with the Proposed Action, the contribution from nearby mines ranges from negligible to larger than the project-only contribution, but the cumulative impacts do not exceed the NAAQS and Nevada AAQS.
- For the locations of maximum impact from all emissions the majority contribution to the maximum value is attributable to the Arturo, Goldstrike, and Hollister mines. Although the maximum cumulative impact for 1-hour NO_2 exceeds the NAAQS and Nevada AAQS the contribution from emissions from the Rossi Mine is small.

3.8.3.2 Reconfiguration Alternative

Cumulative impacts to air quality under the Reconfiguration alternative would be slightly less than the cumulative impacts under the Proposed Action. This reflects the lower emissions likely to result from the Reconfiguration Alternative compared to the Proposed Action (**Table 3.8-10**).

3.8.3.3 Livestock Fencing Alternative

Cumulative impacts to air quality under the Livestock Fencing Alternative would be similar to impacts discussed under the Proposed Action.

3.8.3.4 No Action Alternative

There would be no cumulative air quality impacts under the No Action Alternative. Under the No Action Alternative, the proposed project would not be developed, and the associated air quality impacts would not occur. Mining activities associated with the Rossi Mine, completion of closure and reclamation activities associated with existing disturbance, and ongoing mineral exploration activities within the study area, would continue under existing authorizations. Fugitive dust and gaseous emissions from existing mine operations that currently may affect air quality in the project area would continue.

3.8.4 Potential Monitoring and Mitigation Measures

Air quality emission sources would be subject to requirements of federal and Nevada air quality regulations. The NDEP BAPC air quality permitting process requires the Rossi Mine to submit an application for an amendment to its existing air quality permit to account for the Proposed Action, including a complete inventory of potential criteria air pollutant emissions from the Proposed Action. Current measures applied at the Rossi Mine to minimize dust emissions would continue and would be applicable to the Proposed Action. These are described in **Table 2-16** and have been incorporated into the emission estimates used for the modeling. No additional monitoring or mitigation measures are planned, as no substantive impacts to air quality are anticipated as a result of the Proposed Action. (As noted above, the modeled exceedances of the 1-hour NAAQS for NO_2 are mostly due to the contributions from the nearby mines and not from the Rossi Mine.)

3.8.5 Residual Impacts

There would be no residual impacts to air quality from the Proposed Action or alternatives because reclamation and revegetation would stabilize exposed soil and control fugitive dust emissions. As vegetation becomes established, levels of airborne particulate matter should return to typical conditions of a dry desert environment. Once the disturbance ceases and wind-erodible surfaces are reclaimed, the local air quality is expected to return to approximately its pre-mining condition.

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3.9 Paleontological Resources

3.9.1 Affected Environment

The study area for paleontological resources comprises the authorized and proposed project boundaries—the area in which direct and indirect project-related impacts to paleontological resources are most likely to occur. The CESA for paleontological resources includes the mining activity area in the Carlin Trend north of I-80 to the Hollister Mine, which allows for comparison of the incremental effects from the Rossi Mine Project to overall mining activity in the Carlin Trend. **Figure 3.3-1** presents the study area and CESA boundaries for paleontological resources.

3.9.1.1 Regulatory Jurisdiction

The Paleontological Resources Preservation Act of 2009 (PRPA) (Public Law [P.L.] 111-011; 123 Stat. 1172; 16 United States Code [U.S.C.] 470aaa et seq.) provides Federal agencies with the authority to regulate activities that excavate, remove, damage, or otherwise alter or deface paleontological resources on Federal lands. The Act affirms the authority of earlier Federal statutes protecting paleontological resources on BLM-administered lands, including:

- Antiquities Act of 1906 (P.L. 59-209; 34 Stat. 225, 16 U.S.C. 431 et seq.)
- FLPMA (P.L. 94-579; 90 Stat. 2744; 43 U.S.C. 1701 et seq.)
- NEPA (P.L. 91-190; 83 Stat. 852; 42 U.S.C. 4321-4347)

The statutes listed above provide the authority for various regulations in Title 43 of the CFR that address the collection of invertebrate, vertebrate and plant fossils on BLM-administered lands. BLM Manual 8270 (BLM 1998b) and the BLM Handbook H-8270-1 (BLM 1998c), as well as various BLM instructional memoranda, have been issued to provide guidance to the BLM in managing and protecting paleontological resources.

3.9.1.2 Potential Fossil Yield Classification System

The BLM has adopted the Potential Fossil Yield Classification (PFYC) system to identify and classify fossil resources on federal lands (BLM 2016b). Paleontological resources are closely tied to the geologic units (i.e., formations, members, or beds) that contain them. The probability for finding paleontological resources can be broadly predicted from the geologic units present at or near the surface. Therefore, geologic mapping can be used for assessing the potential for the occurrence of paleontological resources.

The PFYC system is a way of classifying geologic units based on the relative abundance of vertebrate fossils or scientifically important fossils (vertebrate, invertebrate, or plant) and their sensitivity to adverse impacts. Geologic units with higher class numbers indicate a higher potential to yield paleontological resources within the unit as a whole when compared to other geologic units. The PFYC is not intended to be applied to specific paleontological localities or small areas within units. Although significant localities may occasionally occur in a geologic unit, a few widely scattered important fossils or localities do not necessarily indicate a higher class; instead, the relative abundance of significant localities is intended to be the major determinant for the class assignment.

The PFYC system is meant to provide baseline guidance for predicting, assessing, and mitigating paleontological resources. The classification should be considered at an intermediate point in the analysis and should be used to assist in determining the need for further mitigation assessment or actions. The BLM intends for the PFYC system to be used as a guideline as opposed to rigorous definitions. **Table 3.9-1** provides an overview of the PFYC system.

Table 3.9-1. Potential Fossil Yield Classification System

Class	Description	Basis	Comments
1	Igneous and metamorphic (tuffs are excluded from this category) geologic units or units representing heavily disturbed preservation environments that are not likely to contain recognizable fossil remains.	Fossils of any kind known not to occur except in the rarest of circumstances. Igneous or metamorphic origin. Precambrian in age. Landslides and glacial deposits.	The land manager's concern for paleontological resources on Class 1 acres is negligible. Ground disturbing activities will not require mitigation except in rare or isolated circumstances.
2	Sedimentary geologic units that are not likely to contain paleontological resources.	Significant paleontological resources are known to occur very rarely or not at all. Age younger than 10,000 years before present. Aeolian origin. Diagenetic alteration.	The land manager's concern for paleontological resources on Class 2 acres is low. Ground disturbing activities are not likely to require mitigation except where paleontological resources are known or found to exist.
3	Fossiliferous sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence.	Marine in origin with sporadic known occurrences of paleontological fossils. Vertebrate fossils and significant invertebrate fossils known to occur inconsistently; predictability known to be low. Units may contain significant paleontological resources, but these occurrences are widely scattered.	The land manager's concern for paleontological resources on Class 3 acres are moderate because the existence of significant paleontological resources is known to be low. Ground disturbing activities may require assessment by a qualified paleontologist to determine whether significant paleontological resources occur in the area of a proposed project, and whether the action could affect the paleontological resources. Mitigation will depend on the nature of the proposed activity.
4	Class 4 geologic units are known to contain a high occurrence of paleontological resources.	Significant paleontological resources have been documented, but may vary in occurrence and predictability. Surface disturbing activities may adversely affect paleontological resources. Rare or uncommon fossils, including invertebrates or unusual plant fossils, may be present. Illegal collecting activities may impact some areas.	The land manager's concern for paleontological resources on Class 4 acres is moderate to high. Proposed ground disturbing activities normally require field assessment by a qualified paleontologist to determine whether significant paleontological resources occur in the area of a proposed project and whether the action will impact the paleontological resources. Mitigation will depend on the nature of the proposed activity, but in some cases avoidance of known paleontological resources may be necessary. On-site monitoring or spot-checking may be necessary during surface disturbance activities.

Table 3.9-1. Potential Fossil Yield Classification System

Class	Description	Basis	Comments
5	Highly fossiliferous geologic units that consistently and predictably produce significant paleontological resources.	Significant paleontological resources are known and documented to occur consistently, predictably, and/or abundantly. Paleontological resources are highly susceptible to adverse impacts from surface disturbing activities. Unit is frequently the focus of illegal collecting activities.	The land manager's concern for paleontological resources on Class 5 acres is high to very high. A field survey by a qualified paleontologist is almost always needed. Mitigation of ground disturbing activities may be necessary before or during surface disturbance activities. Avoidance or resource preservation through controlled access, designation of areas of avoidance, or special management designations should be considered.
U	Geologic units that have an unknown PFYC assignment.	Area or geologic unit is poorly or under-studied.	The land manager's concern for paleontological resources on Class U acres is medium to high until a provisional assignment is made. Field surveys are normally required, especially prior to authorizing a ground-disturbing activity.
W	Surface area mapped as water.	Most water bodies do not normally contain paleontological resources.	The land manager's concern for paleontological resources on Class W acres is low, but reservoirs and shorelines should be considered for uncovered or transported paleontological resources.
I	Surface area mapped as ice or snow.	Melting icefields and glaciers.	The land manager's concern for paleontological resources on Class I acres is generally low, but receding glaciers/snowfields and exposed moraines should be considered for the potential to reveal recently exposed paleontological resources.

Sources: BLM 2016b; BLM 2014a.

3.9.1.3 Paleontological Resources in the Study Area

Figure 3.3-3 depicts geologic units within the study area, with supporting geologic cross sections in **Figure 3.3-4**. Younger (i.e., less than 10,000 years old) Quaternary alluvium, gravel deposits, and other unconsolidated sediments, which may be found on the land surface or underneath surficial soils at various locations throughout the study area, typically have low potential to contain scientifically significant paleontological resources (i.e., PFYC 2). Paleontological potential in older Quaternary and Tertiary alluvium and gravel deposits, which occur primarily at or near the land surface in the central and southeastern portion of the study area, is variable from one location to another, but these sediments may contain scientifically important vertebrate fossils (i.e., PFYC 3) (BLM 2016b).

Previous BLM NEPA analyses for mining activities along the Carlin Trend have identified the tuffaceous materials within the Miocene Carlin Formation, which consists of a combination of volcanic tuff, tuffaceous sediment, and non-volcanic detritus, as having high potential to contain important paleontological resources (BLM 2013b, BLM 2014a). Although igneous rocks are generally classified as having a low potential fossil yield, the unique depositional circumstances that created the Carlin Formation and high silica content likely helped preserve the bone material of dead animals. Vertebrate fossils that have been found in the Carlin Formation in the project vicinity include varieties of extinct camel, antelope, and ancestors of the horse. The project vicinity is defined as those areas within 20 miles of the project area. A

fossil locality discovered within a few miles of the Hollister Underground Mine Project consisted of vertebrate fossils that had been weathered out of the rock. Specimens from fossil localities in the Willow Creek area have been placed on display at the Northeastern Nevada Museum in Elko. The Carlin Formation is generally characterized as PFYC class 4 or 5, indicating high potential to contain scientifically valuable fossils.

Other geological units in the study area include the Paleozoic Slaven Chert, Vinini Formation, Elder Sandstone, Chert Melange, Bootstrap Limestone, and Rodeo Creek (Chert subunit). These formations may contain invertebrate fossils including graptolites, echinoderms, and radiolarians (Smith and Ketner 1975, Coates 1986, Ettner 1989, Theodore et al. 2006). Invertebrate fossils are often used to determine the age and depositional environment of geologic units, although the mode of deposition of the strata within the study area may have displaced the fossils where they originally occurred (Western Cordillera 2006). In addition, the potential for fossil preservation in the Vinini Formation is generally low because of the deformation to which it has been subjected. The Paleozoic formations listed above would probably rate as Class 2 in the PFYC system because of their age, lack of vertebrate fossils, marine deposition, and extreme deformation (in the case of the Vinini Formation).

No scientifically important vertebrate, invertebrate, or plant fossils have been reported during past exploration and development within the authorized boundary of the Rossi Mine.

3.9.2 Environmental Consequences

Primary issues include the excavation of bedrock formations and sediments in the study area that may contain scientifically important paleontological resources.

3.9.2.1 Proposed Action

No vertebrate, invertebrate, or plant fossils have been discovered within the authorized or proposed project boundaries; however, as described in Section 3.9.1, Affected Environment, some bedrock units have the potential to contain vertebrate or invertebrate fossils. The proposed expansion or development of pits, WRDFs, ponds and other project facilities could damage or destroy paleontological resources present in these areas. Rock disposal and open pit development in the Carlin Formation, the formation with the highest potential to contain scientifically important fossils in the study area, would result in the greatest potential for adverse effects. Additionally, exposures of the Carlin Formation within the project boundary may be covered by waste rock disposal, making future discoveries unlikely. Although fossil localities are present in some areas of the Carlin Formation, recent surveys of the Carlin Formation associated with other mining projects in the CESA have resulted in the collection of few recognizable vertebrate fossils. Most of the fossil material consisted of fragments of fossilized bone of limited scientific value because of the fragmented nature of the material and the fact the material has been eroded from its original place of deposition (Erathem-Vanir 2010).

The excavation or covering of older alluvium and gravel deposits and Paleozoic rock units in the study area could result in adverse impacts, although the potential of these units to contain scientifically important fossils is uncertain and likely highly variable. Also, proposed disturbance is not likely to affect paleontological resources in younger alluvium and gravel deposits, which have low potential for scientifically important fossils. The Bootstrap Limestone and Rodeo Creek (Chert subunit) are unlikely to be affected, or may be minimally affected, by the Proposed Action pits due to their depth, which typically generally exceeds 5,300 feet amsl within the study area (see **Figure 3.3-4** Geologic Cross-Sections. The estimated depth of the QLC Pit, which would be the deepest excavation in the study area, is approximately 5,285 feet amsl.

Indirect impacts from mining activities would include unauthorized collection of scientifically important fossils by workers or the public. There is a very low risk of impacts to fossils on previously authorized disturbed lands.

3.9.2.2 Reconfiguration Alternative

Direct and indirect impacts to paleontological resources would be the same as described for the Proposed Action, except for the following:

- There would be approximately 151 less acres of disturbance under the Reconfiguration Alternative due to modifications to the construction of the QLC Pit and WRDFs. This would slightly decrease the potential to destroy vertebrate, invertebrate, or plant fossils within the study area.

3.9.2.3 Livestock Fencing Alternative

Direct and indirect impacts to paleontological resources would be the same as described for the Proposed Action, except for the following:

- Installation of a perimeter fence around the proposed project boundary would result in seven more acres of surface disturbance that could potentially damage or destroy near-surface paleontological resources. However, due to the shallow excavation depth required to install the fence and the presence of overlying soils in most area, these impacts are anticipated to be negligible.

The livestock fence would be removed once the mine is reclaimed and revegetation is determined successful by the BLM and NDEP.

3.9.2.4 No Action Alternative

Effects of past and ongoing activities at Rossi Mine were addressed in prior environmental analyses listed in **Table 2-1**. The proposed project would not be developed and no additional surface-disturbing activities beyond those currently authorized would occur within the study area. Therefore, no additional impacts to paleontological resources beyond those addressed in prior environmental analysis are anticipated.

3.9.3 Cumulative Impacts

The CESA for paleontological resources is defined in Section 3.9.1, Affected Environment, and is shown in **Figure 3.3-1**. The past, present, and RFFAs are discussed in Section 3.2, Past, Present and Reasonably Foreseeable Future Actions. RFFAs for mining and exploration activities are identified in **Table 3.2-1**; their locations are shown in **Figure 3.2-1** and **Figure 3.2-2**.

3.9.3.1 Proposed Action

Because the various mining operations and other past, present, and RFFAs for utility and energy development the CESA are located on bedrock formations with varying fossil potential, not all disturbances pose the same level of risks to paleontological resources. Therefore, the cumulative impacts to paleontological resources from past, present, and RFFAs within the CESA are difficult to quantify. Incremental adverse effects to paleontological resources from the Proposed Action would be minimal due to the extensive disturbance that has already taken place where the Carlin Formation outcrops in the CESA (Moore 2002, Norby 2002, Theodore et al. 2006).

3.9.3.2 Reconfiguration Alternative

The incremental increase of potential disturbance to the Carlin Formation would be similar to the incremental effects associated with the Proposed Action, except that there would be approximately 151 less acres of surface disturbance under this alternative. Relative to existing disturbance in the CESA, the magnitude of cumulative impacts under this alternative would be essentially the same as the Proposed Action.

3.9.3.3 Livestock Fencing Alternative

The incremental increase of potential disturbance to the Carlin Formation would be similar to the incremental effects associated with the Proposed Action and Reconfiguration Alternative, except that there would be approximately 7 more acres of surface disturbance under this alternative. Relative to existing

disturbance in the CESA, the magnitude of cumulative impacts under this alternative would be essentially the same as the Proposed Action.

3.9.3.4 No Action Alternative

Under the No Action Alternative, past and present actions would continue as approved and RFFAs would be evaluated prior to approval. Effects of the No Action Alternative on range resources have been addressed in prior environmental analyses of past and present actions and the effects of RFFAs would be addressed through future analyses. Failing to approve the proposed project would not alter those effects, so there would be no cumulative effects on paleontological resources from the No Action Alternative.

3.9.4 Potential Monitoring and Mitigation Measures

The following mitigation measure is recommended for paleontological resources.

Issue: Potential impacts to scientifically important invertebrate, vertebrate, or plant fossils, if present, requiring protection under applicable laws and regulations detailed in BLM Manual H-8270 (BLM 1998c).

Mitigation Measure P-1: HES would coordinate with the BLM and provide funding and other resources, as needed, to ensure implementation of the following procedures designed to protect paleontological resources within the project area.

- Field surveys would be conducted by a qualified paleontologist in areas underlain by the Carlin Formation that would be affected by construction, pit expansion, or waste rock storage. The field surveys would identify if there are surface exposures containing visible fossils and if there is a potential for buried fossils within the disturbance footprint. If any important fossils are found during the field survey, a program would be developed and implemented to remove any exposed fossils prior to ground disturbing activities.
- Construction areas identified as having a high potential for buried paleontological resources based upon the field survey, regardless of the mapped geologic unit present, would be monitored by a qualified paleontologist during ground disturbance, including grading, excavation, and trenching.
- Any fossils recovered during the field survey or construction monitoring would be prepared in accordance with standard professional paleontological techniques. A report on the findings of the salvage program, including a list of the recovered fossils, would be prepared following completion of the program. A copy of this report would accompany the fossils to the BLM-approved facility where they would be curated.

Effectiveness: This measure would allow for the evaluation of any fossils that may be discovered and provide adequate time for their preservation or data recovery.

3.9.5 Residual Impacts

If no fossils exist within the proposed project boundary, there would be no residual impacts to paleontological resources. If fossils are present, the implementation of the mitigation measures listed above would minimize the potential for residual impacts to paleontological resources by increasing the likelihood that they would be discovered through surveys conducted before or during construction. Residual impacts may still occur if paleontological resources are present, but remain undiscovered by surveys or are inadvertently destroyed before they can be removed and identified. Additional residual impacts could occur due to the loss of potentially important fossils covered by waste rock in WRDFs.

3.10 Social and Economic Values

The social and economic values assessment focuses on socioeconomic aspects potentially affected by project construction and operations.

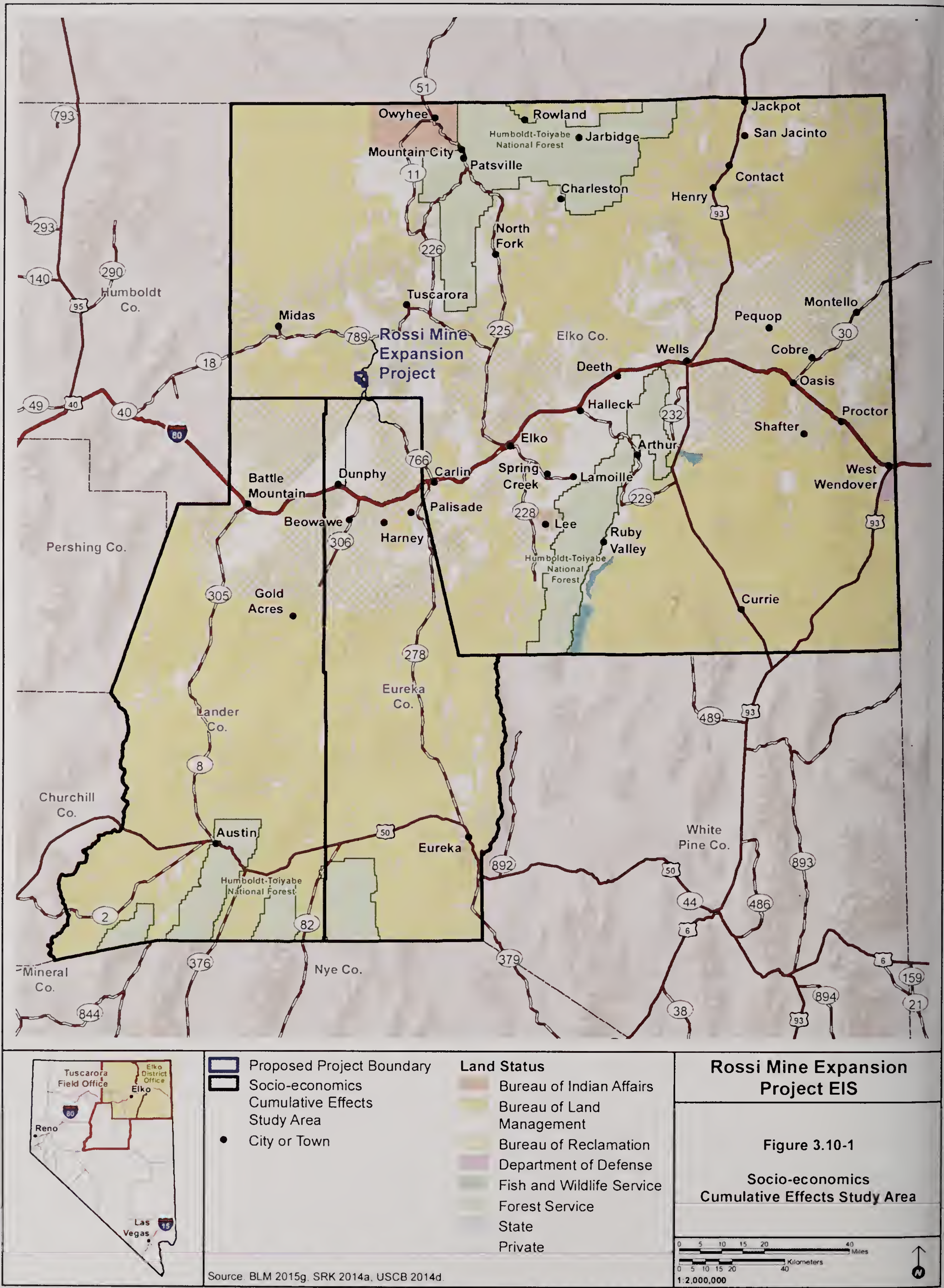
3.10.1 Affected Environment

The study area for direct and indirect impacts, and the CESA for this project are the counties of Elko, Eureka and Lander, and the communities in these counties within commuting distance from the project sites and where the project-related labor force may reside (**Figure 3.10-1**). Elko County is included because the project expansion area is in this county. Elko County provides some services to the project and would receive tax collections associated with mine expansion. In addition, approximately 12 percent of the current Rossi Mine workforce reside in the communities of Elko and Spring Creek, in Elko County (HES 2014a). Eureka County provides some services along the access roads leading to the mine from Dunphy (Boulder Valley Road) and from Carlin (Nevada SR 766). Lander County is included because approximately 88 percent of the current Rossi Mine workforce reside in the community of Battle Mountain (HES 2014a). Two other communities within the same general area are in commuting distance from the project site and were included in this section as well for analysis, Carlin (Elko County) and Crescent Valley (Eureka County). **Table 3.10-1,** below, shows the distance from the communities considered in the study area and the Rossi Mine site.

Table 3.10-1. Travel Distance from Communities in the Study Area to the Rossi Mine Site

County and Community	Distance from Rossi Mine (miles)
Elko County	
Carlin	35
Elko	57
Spring Creek	71
Lander County	
Battle Mountain	57
Eureka County	
Dunphy	32
Crescent Valley	61

Source: HES 2014a.



Rossi Mine Expansion Project EIS

Figure 3.10-1

Socio-economics Cumulative Effects Study Area

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notice.

2/20/2018

3.10.1.1 Population and Demography

Elko County has an estimated population of 54,998 and is the fourth most populous county in Nevada. Lander and Eureka counties have considerably less population, 6,708 and 2,067, respectively (**Table 3.10-2**). Of the three counties, Elko County grew the most in the 1990-2000 period, Eureka County grew the most in the 2000-2010 period, and Lander County is projected to have the most growth in the period 2000-2015 on a percent growth basis. Lander County's population actually declined between 1990 and 2010 (**Table 3.10-2**). The largest community in the study area is the city of Elko, within Elko County, with a population of 20,613, followed by the community of Spring Creek, with a population of 13,926, which is located about 15 miles southeast of the city of Elko. Together, the communities of Elko and Spring Creek concentrate over 50 percent of the population of the study area.

Table 3.10-2. Population in the Study Area, 1990–2015

County and Community	1990	2000	2010	2015	Average Annual Percentage Change, 1990-2000	Average Annual Percentage Change, 2000-2010	Average Annual Percentage Change, 2010-2015
Elko County	**33,530**	**45,291**	**48,818**	**54,993**	**3.05%**	**0.75%**	**2.41%**
Carlin	2,220	2,161	2,368	2,668	-0.27%	0.92%	2.41%
Elko	14,736	16,708	18,297	20,613	1.26%	0.91%	2.41%
Spring Creek	5,866	10,548	12,361	13,926	6.04%	1.60%	2.41%
Lander County	**6,266**	**5,794**	**5,775**	**6,708**	**-0.78%**	**-0.03%**	**3.04%**
Battle Mountain	3,542	2,967	3,635	4,222	-1.76%	2.05%	3.04%
Eureka County	**1,547**	**1,651**	**1,987**	**2,067**	**0.65%**	**1.87%**	**0.79%**
Dunphy	NA	NA	NA	NA	NA	NA	NA
Crescent Valley	NA	NA	392	408	NA	NA	0.79%

Sources: USCB 1990; USCB 2000; USCB 2010; Nevada State Demographer's Office 2014 (for 2015 projections).

Note: To estimate the current population for the communities in the study area, BLM assumed the average annual percentage changes in population for communities during the period of 2010-2015 are the same as those for their respective counties.

Table 3.10-3 shows the projected population in the study area for the period 2010-2030. Elko County is projected to have the highest growth rates in the study area between 2010 and 2020, with Eureka County having the highest growth rate between 2020 and 2030. The communities of Elko and Spring Creek are projected to continue to concentrate over 50 percent of the population of the study area.

Table 3.10-3. Population in the Study Area, 2010–2030

County and Community	2010	2020	2025	2030	Average Annual Percentage Change, 2010-2020	Average Annual Percentage Change, 2020-2030
Elko County	**48,818**	**57,449**	**58,253**	**57,939**	**1.64%**	**0.85%**
Carlin	2,368	2,786	2,907	2,577	1.64%	0.85%
Elko	18,297	21,529	22,460	19,913	1.64%	0.85%
Spring Creek	12,361	14,545	15,173	13,453	1.64%	0.85%
Lander County	**5,775**	**6,574**	**6,037**	**5,908**	**1.30%**	**-1.06%**
Battle Mountain	3,635	4,136	3,922	3,268	1.30%	-1.06%
Eureka County	**1,987**	**2,126**	**2,299**	**2,543**	**0.68%**	**1.81%**
Dunphy	NA	NA	NA	NA	NA	NA
Crescent Valley	392	419	459	469	0.68%	1.81%

Sources: USCB 2010 (for 2010 data); Nevada State Demographer's Office 2014 (for projections).

Note: To estimate the future population for the communities in the study area, BLM assumed the average annual percentage changes in population for communities during the period of 2010-2030 are the same as those for their respective counties.

3.10.1.2 Employment and Income

The largest economy in the study area is that of Elko County that concentrates over 85 percent of the private establishments and paid employees (**Table 3.10-4**). Mining drives the economy of the study area and is the largest employer. Other important sectors include accommodation and food services, retail trade, health care and social assistance, construction, transportation and warehousing and professional services (**Table 3.10-4**).

Table 3.10-4. Establishments and Employment by Industry, 2013[1]

Industrial Sector	Elko County		Lander County		Eureka County	
	Establishments	*Paid Employees*	*Establishments*	*Paid Employees*	*Establishments*	*Paid Employees*
Mining, Quarrying, and Oil and Gas Extraction	3%	25%	2%	17%-33%	18%	57%-83%
Construction	10%	6%	11%	2%	9%	0%-1%
Retail Trade	14%	11%	23%	16%	16%	1%-6%
Transportation and Warehousing	4%	3%	5%	13%	7%	1%-6%
Professional, Scientific, and Technical Services	9%	3%	1%	0%-1%	7%	0%-1%
Health Care and Social Assistance	11%	7%	8%	7%-17%	4%	0%-1%
Accommodation and Food Services	14%	25%	15%	6%	18%	3%
Other	35%	19%	34%	0%	22%	0%

Source: USCB 2013.

Note: By place of work.

[1] **Table 3.10-4** uses USCB County Business Patterns data. These data do not include government workers and may undercount employment relative to other sources such as the BLS Quarterly Census of Employment and Wages and the Bureau of Economic Analysis data (BEA 2016).

Table 3.10-5 shows total employment and wages for 2014, by place of work, including employment with federal, state and local governments. Some employment is not captured by these data, such as proprietors, the unincorporated self-employed and some farm and domestic workers. Wages include most forms of compensation, including benefits such as health insurance, and including money withheld for income taxes.

Table 3.10-5. Total Employment and Earnings by Place of Work, 2014

Area	Employment	Earnings
Elko	22,264	$1,056,803,425
Eureka	4,422	$397,492,697
Lander	3,507	$243,905,783
Total	**30,193**	**$1,698,201,905**

Source: BLS 2015a.

Table 3.10-6 shows the labor force in the study area. Over 85 percent of the labor force of the study area resides in Elko County, which also has the lowest unemployment rate. The unemployment rate has been declining in the study area since its recent peak in 2010 (**Figure 3.10-2**).

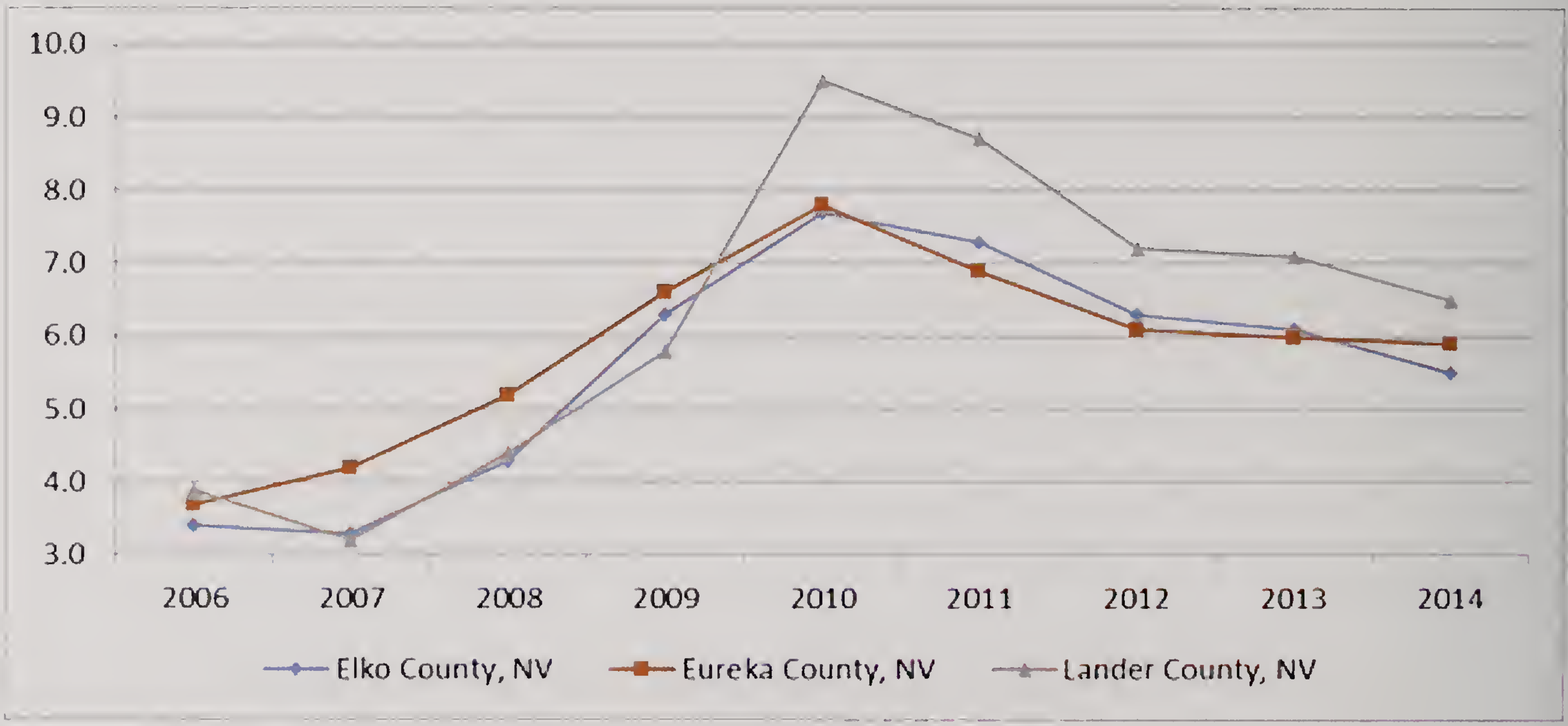
Table 3.10-6. Labor Force, 2014

Industrial Sector	Elko County	Lander County	Eureka County
Labor Force	28,175	3,360	1,071
Employed	26,631	3,143	1,008
Unemployed	1,544	217	63
Unemployment Rate	5.5%	6.5%	5.9%

Source: BLS 2015b.

Note: By place of residence

Figure 3.10-2. Unemployment Rates, 2006–2014



Source: BLS 2015b.

Per capita income in the study area tends to be higher than average per capita incomes for the state of Nevada. However, per capita incomes declined in Elko and Eureka counties between 2012 and 2014, compared to a growth in the state as a whole (**Table 3.10-7**).

Table 3.10-7. Per Capita Income, 2014

Area	2012	2013	2014
Elko	$42,340	$41,530	$41,702
Eureka	$35,574	$33,182	$34,531
Lander	$48,561	$49,219	$51,055
Nevada	$39,436	$39,223	$40,742

Source: BEA 2015.

Note: by place of residence.

3.10.1.3 Housing

Table 3.10-8 shows the number of housing units available in communities within commuting distance of the project site. The communities of Elko and Spring Creek concentrate most of the housing units in the study area. As of 2014, housing units vacant and available for rent or for sale were located in the communities of Elko and Carlin. Many of the vacant housing units in the study area are for seasonal, recreational or occasional use (USCB 2014a).

Table 3.10-8. Housing Availability, 2014

County and Community	Total Housing Units	Occupied (%)	Vacant		
			Total	*For Rent*	*For Sale*
Elko County					
Carlin	1,061	75.30%	262	30	15
Elko	7,332	91.60%	615	154	19
Spring Creek	4,699	99.10%	41	0	0
Lander County					
Battle Mountain	1,410	84.40%	220	0	0
Eureka County					
Dunphy	N/A	N/A	N/A	N/A	N/A
Crescent Valley	232	71.10%	67	0	0

Source: USCB 2014a.

In addition to long-term housing units, hotels, motels and Recreational Vehicles (RV) and mobile home parks are also available in the study area. **Table 3.10-9** provides a partial list. The largest number of hotel and motel rooms is located in the city of Elko. There are a considerable number of RV and mobile home parks in the communities of Carlin and Battle Mountain.

Table 3.10-9. Temporary Housing Availability, 2013

County and Community	Hotels and Motels		RV and Mobile Home Parks	
	Establishments	*# Rooms*	*Establishments*	*# of Spaces/Pads*
Elko County				
Carlin	2	80	13	N/A
Elko	32	2,500	6	500
Lander County				
Battle Mountain	7	277	9	449
Eureka County				
Crescent Valley	0	0	1	N/A

Source: HES 2014a.

3.10.1.4 Community Facilities and Services

Water Supply and Treatment

Water supply in Battle Mountain is provided by the Lander County and Water District #1. As of 2011, new wells and storage tanks were expected to allow considerable expansion of services. In the city of Elko water production capacity was 14.5 million gallons per day (mgd) in 2011 with use ranging between 3 mgd and 13 mgd. Spring Creek Utilities provides water to Spring Creek and Brentwood subdivisions using public wells. Carlin's water is sourced from one deep-water well and several natural springs. Peak production capacity is approximately 1.4 mgd with actual production average approximately half that much. Crescent Valley has two wells totaling 550 gpm and average daily demand was 136 gpm with peak of 232 gpm (HES 2014a).

Battle Mountain's wastewater treatment facility has capacity to treat 0.8 mgd with current use estimated at around 0.4 mgd. The City of Elko water reclamation facility has capacity of 4.5 mgd with current use estimated at 3.5 mgd. Carlin uses two lagoons with rapid infiltration basins. Spring Creek and Crescent Valley use private sceptic systems (HES 2014a).

Solid Waste

Solid waste facilities in the study area have between 20 to 30 (Eureka County) and 200 (City of Elko) years remaining of useful life. As of 2010, Battle Mountain's solid waste facility had a useful life of 50 years remaining. (HES 2014a).

Law Enforcement

The Elko County Sherriff's Department provides law enforcement in the Rossi Mine area. The Nevada Highway Patrol provides law enforcement on state highways, and the municipalities of Carlin and Elko maintain police departments. The Lander County Sheriff's Department provides law enforcement services in Battle Mountain. The Elko County Sheriff's Department provides law enforcement services in Spring Creek and maintains a substation in the area. The Eureka County Sheriff's Department maintains a substation in Crescent Valley staffed with three sworn law enforcement personnel, who provides law enforcement services to the northern part of the county (HES 2014a).

Emergency Response

The BLM Elko District Office's fire suppression organization employs over 70 permanent, career seasonal, and temporary Seasonal employees. The City of Elko Fire Department has two staff officers, one fire prevention bureau specialist, one administrative technician and eight career firefighters supported by 24 volunteer positions when fully staffed. The Spring Creek Volunteer Fire Department maintains two fire stations in the Spring Creek area. The Spring Creek area is served by a fire protection district that is administered by the Nevada Division of Forestry in accordance with NRS 473. The district was formed in order to provide fire protection for the unincorporated portions of Elko County. The Carlin Volunteer Fire Department (CVFD) is directed by a Chief appointed by the City Council with up to 35 members. CVFD serves Carlin and assists in surrounding communities with fire suppression services and ambulance transport services at the Emergency Medical Technician (EMT) Intermediate level. The Battle Mountain Volunteer Fire Department has an all-volunteer staff of 25 officers and firefighters. Eureka County provides a facility, equipment, training, and supplies for an all-volunteer fire department and EMT/ambulance services in Crescent Valley. In 2010, there were 17 volunteers stationed in Crescent Valley. Fire stations with 10 volunteers each are located in Beowawe and Dunphy (HES 2014a).

Elko County Ambulance Service is the primary service provider for Elko County. The Battle Mountain Ambulance Service is a volunteer organization with 25 emergency medical technicians and three ambulances. In Eureka County's Crescent Valley area, all medical emergencies are transported to Elko, the closest emergency facility (HES 2014a).

Health Care and Education

The Northeastern Nevada Regional Hospital (NNRH) located in Elko has 75 rooms and operates a 24-hour emergency room, a full-service laboratory, an intensive care unit, magnetic resonance imaging and computerized aerial tomography scan capabilities, and provides most major medical specialty services. The Carlin Community Health Center provides service in family medicine, preventative health, women's health, children's health and immunizations, health education, prenatal and newborn care, and pharmacy services. The Battle Mountain General Hospital and clinic has 23 beds, an emergency/trauma suite, laboratory, x-ray, respiratory therapy, and physical therapy facilities. Eureka County maintains a health clinic in Crescent Valley, which is staffed one or two days per week by a physician, a medical assistant and administrative staff (HES 2014a).

The Elko County School District operates four elementary schools, an intermediate school, a middle school, and a high school in Elko; two elementary schools, a middle school, and a high school in Spring Creek; and an elementary school, a junior high school, and a high school in Carlin. The Lander County School District operates two elementary schools, a junior high school, and a high school in Battle Mountain. The Eureka County School District operates an elementary school in Crescent Valley; junior high and high school students are bused to Carlin. Total student enrollment in fall of 2012 was 10,113 in the Elko school district, 1,093 in the Lander school district, and 266 in the Eureka school district (HES 2014a).

3.10.1.5 Public Finance

County and city governments in the study area are funded mostly by property taxes and intergovernmental transfers from state and federal sources. **Table 3.10-10** shows general fund revenues for the three counties in the study area for the fiscal year (FY) 2012–2013. In all counties, at least 45 percent of revenues were from intergovernmental transfers, with at least another 30 percent from property taxes.

Table 3.10-10. County Revenues in the Study Area, Fiscal Year 2012–2013

	Elko County	Lander County	Eureka County
General Fund Revenues	**$41,225,802**	**$19,190,726**	**$15,169,005**
Property Taxes	$12,545,451	$7,764,170	$5,109,733
Intergovernmental Transfers	$21,913,833	$8,644,149	$8,049,750
Other	$6,766,518	$2,782,407	$2,009,522

Source: HES 2014a.

Intergovernmental transfers include the distribution to counties, cities and school districts of sales taxes generated in those counties, cities and school districts. In FY 2013, the sales tax rate for Elko and Eureka counties was 6.85 percent. In Lander County it was 7.10 percent (Nevada Department of Taxation 2013).

Table 3.10-11 shows that cities relied more strongly than counties on other local taxes and fees than on property taxes, although property taxes were still over 10 percent of total city revenues.

Table 3.10-11. City Revenues in the Study Area, Fiscal Year 2012–2013

	City of Elko	City of Carlin
Budgeted Annual Revenues	**$22,653,095**	**$2,599,941**
Property Taxes	$3,676,885	$312,789
Intergovernmental Transfers	$12,544,743	$1,816,577
Other	$6,431,467	$470,575

Source: HES 2014a.

In addition to funding county general funds, county property taxes typically contribute to proprietary funds as well, such as those for ambulance, solid waste and other services. **Table 3.10-12** shows a breakdown of county property tax rates between the general fund and other (proprietary) funds. The rates are expressed in percentages.

Table 3.10-12. County Property Tax Rates, Fiscal Year 2012–2013

	Elko County	Lander County	Eureka County
General Fund	0.5512	1.2303	0.5580
Other	0.2874	0.6940	0.2878
Total	**0.8386**	**1.9243**	**0.8458**

Source: HES 2014a.

Note: Rates are dollars of taxes per $100 of assessed value.

Table 3.10-13 shows estimated assessed valuations and tax rates for property taxes in the counties, cities and towns in the study area. Properties taxed include proceeds of minerals, net of costs directly involved in their production. Actual property tax collections would likely be less than the multiplication of the assessed values shown and tax rates, because of abatements allowed on actual property taxes.

Table 3.10-13. Property Tax Assessed Valuations and Rates, Fiscal Year 2015–2016

	Assessed Valuation	Estimated Net Proceeds of Minerals	Total Assessed Valuation	City or Town Tax Rate	County Tax Rate	School Tax Rate	Special Districts Tax Rate	State Tax Rate	Total Property Tax Rate
Elko County	**$1,786,375,922**	**$115,561,277**	**$1,901,937,199**	**-**	**0.8386**	**1.5000**	**0.0537**	**0.1700**	**2.5623**
City of Elko	$482,366,245	$23,000	$482,389,245	0.9200	0.8386	1.5000	0.0537	0.1700	3.4823
City of Carlin	$34,150,020	-	$34,150,020	1.1480	0.8386	1.5000	0.0537	0.1700	3.7103
Lander County	**$705,976,617**	**$462,548,330**	**$1,168,524,947**	**-**	**1.9243**	**0.7500**	**0.5109**	**0.1700**	**3.3552**
Battle Mountain Town	$48,209,863	-	$48,209,863	0.0500	1.9243	0.7500	0.5109	0.1700	3.4052
Eureka County	**$863,783,668**	**$667,116,835**	**$1,530,900,503**	**-**	**0.8458**	**0.7500**	**0.0085**	**0.1700**	**1.7743**
Crescent Valley Town	$3,968,368	-	$3,968,368	0.2153	0.8458	0.7500	0.0085	0.1700	1.9896

Source: Nevada Department of Taxation 2015.

3.10.1.6 Social Values

As described in Section 3.10.1.2, Employment and Income, mining drives the economy of the study area. Other sectors of importance for employment and earnings may be to some extent driven by mining activities, such as the accommodation and food services sector. Much of the land in the study area is public land. For example, Elko County has 86.5 percent of its lands under the jurisdiction of federal agencies (Elko County 2008). Activities consistent with this land ownership are, therefore, also of particular importance to the study area, such as grazing and outdoor recreation. Elko County's public land base is also increasingly valued for open space amenities, such as its wildlife and viewshed (Elko County 2008).

At the same time as local populations value the quality of life acquired through their traditional livelihoods, counties in the study area have been interested in the diversification of their economies, to ensure economic stability. An example of this interest is the recently completed Northeastern Nevada Regional Railport and Industrial Park (NNRR) near Elko. Elko County-owned, it functions as a multimodal trans-loading facility, the largest in the state. It has direct access to I-80 and is served by both the Union Pacific and Burlington Northern railroads. It also includes an industrial park served by utilities, which is suitable for most light-industrial or manufacturing applications (NNRDA No Date).

3.10.2 Environmental Consequences

There are two main drivers of socioeconomic impacts associated with the Proposed Action and alternatives. The first one is the increased employment, local expenditures and production during construction, during the extended period of operations and during reclamation. The second is the reduced availability of public lands for other uses during construction and during the extended period of operations. These two drivers have the potential to affect earnings by the workforce in the study area, the population of the study area, the demand for housing and public services, local fiscal revenues and social values.

3.10.2.1 Proposed Action

Under the Proposed Action, construction of open pits, WRDFs, haul and access roads, and ancillary and supporting facilities would be completed as mining progresses. The costs of construction of these components and the associated construction employment are, therefore, distributed over the 8 years of proposed mining activities. Ancillary and supporting facilities include office buildings and storage facilities, lighting at the newly developed areas, a power line extension, a new fuel farm, and various water related infrastructure work as described in Section 2.3, Proposed Action.

Table 3.10-14 shows current employment at the mining site and expected employment with expanded production during the 8-year expansion period. Operations employment varies with production and the current employment numbers shown in the table are those for July of 2013. Under the PoO, these magnitudes would be expected though 2018. The magnitudes shown under the expanded production would be expected to start in 2018, so there is some overlap between the two scenarios. During the expanded production period, employment would range between 24 and 60 at the jig plant and between 60 and 300 mining contractors, depending on barite ore production levels. The employment numbers shown in the table are the upper end of that range and are the numbers used as an upper bound for analysis. The increase in trucking/road maintenance contractor employees was assumed proportional to the increase in jig plant operators. Construction personnel could range between 3 and 50 construction workers.

Table 3.10-14. Proposed Action Associated Annual Employment

	Current Number of Employees	Employees under Expanded Production and Construction (Up To)
Halliburton geologists, engineers and jig plant operators	24	60
Mining contractors	60	300
Trucking/road maintenance contractor employees	9	23
Construction workers (short-term)		50
Total Annual Employment	**93**	**433**

Sources: HES 2014a; SRK 2014a.

Note: Increase under expanded production assumed proportional to increase in jig plant operators.

In addition to an increase and extension in Rossi Mine employment, the Proposed Action would also represent an expected increase in production and local expenditures. Current levels of production are confidential information. However, under the Proposed Action production costs are estimated to average about $533 million a year over the 8-year period, including any expenses with labor. This includes costs with ore mining and crushing and with jigging, hauling, water and reclamation, although reclamation expenses are likely to extend beyond the 8-year period (HES 2015e).

The main uses of the public lands in the project area are mining and grazing. The Proposed Action would increase disturbance in this area and potentially displace grazing activities. However, the one grazing allotment in this project area is the Twenty-Five Allotment. This allotment has a total of 309,390 acres of public land and 214,693 acres of private land for a total of 524,083 acres. Cattle and horse are permitted to graze on public lands within this allotment by one livestock owner, the 25 Ranch LLC (HES 2014b). The project area represents less than 1 percent of the total acreage available in Twenty-Five Allotment, and public lands within the project area represent little more than 1.1 percent of public lands in the allotment. Because the area within the PoO boundary is a small share of the area available for grazing in the allotment, there would be no loss of economic activity as a result of the Proposed Action, and that cattle and horse grazing would likely be shifted to other parts of Twenty-Five Allotment. Expansion of the mine would result in suspending some Animal Unit Months (AUM) in the Twenty-Five Allotment (see Section 3.16, Range Resources). A potential economic impact of the Proposed Action on current economic activities making use of lands in the project area, would be the potential for accidental collision or harm to grazing cattle and horses, from operating machinery and trucks in the area.

Employment and Earnings

Under the Proposed Action, a total of up to 433 employees would be expected to be working at the site, whether directly employed by Halliburton, or employed by mining, transportation or construction contractors. The actual number would vary considerably depending on market demand for barite, but would be expected to be no less than the current employment of 93 employees (**Table 3.10-14**). **Table 3.10-15** shows the expected Proposed Action share of the total employment and wages in the study area. The expected share would range from 0.3 percent to 1.4 percent of total study area employment and from 0.4 percent to 2.1 percent of total study area labor earnings, depending on annual production. Production is subject to market demand. The fact that labor earnings associated with the Proposed Action are likely a higher share of study area labor earnings than the share of Proposed Action associated employment relative to total study area employment, reflects the relatively high labor earnings expected from the Proposed Action relative to average labor earnings in the study area.

Table 3.10-15. Proposed Action Share of Study Area Employment and Wages, On Site Employment

	Total Employment (range)		Estimated Average Annual Wages	Total Labor Earnings (range)	
Proposed Action On Site Employment and Payroll (range)	**93**	**433**		**$7,584,129**	**$35,182,063**
Halliburton geologists, engineers and jig plant operators	24	60	$85,425	$2,050,200	$5,125,500
Mining contractors	60	300	$85,425	$5,125,500	$25,627,500
Trucking/road maintenance contractor employees	9	23	$45,381	$408,429	$1,043,763
Construction workers		50	$67,706	$0	$3,385,300
Total Employment and Labor Earnings in the Study Area (2014)	**30,193**			**$1,698,201,905**	
Proposed Action Share of Employment and Labor Earnings in Study Area (range)	**0.3%**	**1.4%**		**0.4%**	**2.1%**

Sources: **Table 3.10-14**; BLS 2015a.

In addition to the on-site employment, the Proposed Action would generate employment indirectly, through processing at the Dunphy Mill, and through providers of services, input and equipment. As of December of 2015 there were 20 Halliburton employees at the Dunphy Mill (HES 2015e). To the extent that production at the Rossi Mine increases over the 8-year Proposed Action period, the number of associated employees at the Dunphy Mill would also be expected to increase.

The extent of the local indirect impact on employment and earnings through providers of services, input and equipment, depends on the extent to which providers are local, the extent to which the suppliers of the providers are local, and so on along the supply chain. Information provided by Halliburton (HES 2015e) indicate that first round providers are largely local. These include equipment retailers (e.g., loader and truck dealers), providers of various types of services (e.g., portable toilets, laundry, fuel, engineering and environmental services, drilling services, transportation, waste disposal services) with most of these providers located in Elko. The providers of these providers, however, may often not be local (e.g., equipment manufacturers). The Proposed Action would also support additional employment through the local expenditures of the Rossi Mine workforce and the mine's local service providers. This is often called "induced employment."

A quantitative estimate of the indirect and induced employment and earnings generated by the Proposed Action (the multiplier effect), can be obtained by using factors estimated in a 2007 study of the economic impacts of hard rock mining in the Elko Micropolitan Statistical Area (Price and Harris 2007). The Elko Micropolitan Statistical Area consists of Elko and Eureka counties. Because Lander County is not included, the multiplier effect in that study is likely slightly less than the multiplier effect in the study area for this EIS. Also, the 2007 study uses 2004 multipliers obtained from the Impact Analysis for Planning (IMPLAN) regional economic model. These multipliers are estimated based on inter-industry and regional trade data and are updated regularly. Current multipliers could be slightly different. The 2007 study still provides a reasonable reference because mining's economic impact on the local area has not substantially changed since the report was published. Based on this study, every direct job in hard rock mining in the Elko and Eureka counties area would support an additional 0.86 indirect and induced jobs. In addition, every dollar of labor earnings would support an additional $0.36 of a dollar in indirect and induced labor earnings. The lower multiplier for earnings reflects the relatively high earnings of hard rock mining workers compared to workers in sectors of indirect and induced employment. **Table 3.10-16** shows the total Proposed Action share of employment and labor earnings in the study area, including indirect and induced effects. The numbers for induced employment in **Table 3.10-16** may be

overestimated because most of the additional employment is expected to be taken by the workforce already in the study area (see the next sections, “Population, Housing, and Public Services,” for a discussion). To the extent that this workforce has some form of income (e.g., unemployment insurance), the increase in earnings (and consequently the increase in associated local expenditures) could be less.

Table 3.10-16. Proposed Action Share of Study Area Employment and Wages including Indirect and Induced Effects

	Total Employment (range)		Total Labor Earnings (range)	
Proposed action on site employment and payroll (range)	93	433	$7,584,129	$35,182,063
Potential indirect and induced employment and labor earnings (order of magnitude)	80	372	$2,730,286	$12,665,543
Total Proposed Action associated employment and labor earnings	173	805	$10,314,415	$47,847,606
Total Employment and labor earnings in the Study Area (2014)	**30,193**		**$1,698,201,905**	
Proposed Action Share of Employment and labor earnings in Study Area (range), including indirect and induced effects	**0.6%**	**2.7%**	**0.6%**	**2.8%**

Sources: **Table 3.10-14**; Price and Harris 2007.

Some additional direct and indirect induced employment and earnings impacts would be associated with a potential increase in employment at the Dunphy Mill during the Proposed Action 8-year period, and with reclamation activities that extend beyond the 8-year Proposed Action period.

Population

The impact of the Proposed Action on population depends largely on the extent to which production would be raised above current levels. As previously noted, this depends on market demand. Current production levels generate employment at the levels reflected by the lower end of the range shown in **Table 3.10-15** and **Table 3.10-16**. With this level of production, the Proposed Action would not attract new workers to the study area and would have no effect on population when compared to current conditions. At higher production levels, additional workers would be needed on site, up to the higher end of the range shown in **Table 3.10-15**. This would constitute up to 340 more workers than current conditions. The extent to which this would have an impact on population depends on the extent to which these workers are available to be hired from the local communities or would need to be brought from outside the study area. In addition, if this number of workers is maintained for long periods, workers are more likely to move to the area with their families than if work is short-term.

As shown in **Table 3.10-6**, there were 1,824 unemployed workers in the study area in 2014. There are no data available on the potential occupation of unemployed workers. However, if the potential sector of employment for the unemployed were distributed similarly to the distribution of the employed workforce in Elko County in **Table 3.10-4,**[1] there would be 456 unemployed potential workers for the mining, quarrying and oil and gas sector, 109 unemployed potential workers for the construction sector and 54 unemployed potential workers for the transportation and warehousing sector. It is expected that the great majority of the additional employees needed would be hired locally. This is more likely, the more the peak levels of employment are not sustained and actual employment fluctuates over the 8-year period, as expected. Therefore, impacts on the local population from the Proposed Action would be negligible.

[1] *Elko County's distribution was used due to the undisclosed numbers for Lander and Eureka counties.*

Housing and Public Services

Because impacts on the local population are expected to be negligible, any incoming workers would not be expected to generate a perceptible increase in demand for housing and public services. To the extent that a portion of the Proposed Action labor force does move into the study area for short or long periods of time, **Table 3.10-9** shows that there are over 3,800 hotel and motel rooms and RV and mobile home spaces or pads in the study area, and **Table 3.10-8** shows that there were over 180 housing units for rent in 2014. The current housing and short-term stay infrastructure is expected to be able to accommodate any incoming workers associated with the Proposed Action.

Because demand for public services is proportional to population, and because the Proposed Action is not expected to lead to a perceptible increase in population in the study area, any increase in demand for public services is expected to be negligible.

Local Fiscal Revenues

As discussed in Section 3.10.1.5, Public Finance, the main source of local tax revenues are property taxes. In 2013, the Rossi Mine paid $8.5 thousand in property taxes to Elko County. An additional $54.7 thousand were paid by the Dunphy Mill (HES 2015e). These values correspond to approximately 0.5 percent of Elko County property tax collections of FY 2012-2013 (as shown in **Table 3.10-10**). Because of expansions in subsequent years, the contribution of the Rossi Mine and Dunphy mill to local property taxes increased. In 2014 and 2015, the Rossi Mine paid an average of $88.7 thousand in property taxes to Elko County and the Dunphy Mill paid an average of $207.4 thousand (HES 2015e). Because property taxes include net proceeds of minerals, the Proposed Action would not only extend the contribution of the Rossi Mine to local property taxes for the production period, but also increase the contribution to the extent that the volume of production increases.

In addition to property taxes, local expenditures associated with the Proposed Action would pay sales taxes. A portion of sales tax collection is distributed to the counties, cities and school districts where they are collected.

Social Values

The Proposed Action would extend mining activity in the study area. This would contribute to the continuation of mining as a main form of livelihood to the local population, and would tend to reinforce existing social values rather than alter them.

3.10.2.2 Reconfiguration Alternative

Under the Reconfiguration Alternative, the socioeconomic impacts would be indistinguishable from those of the Proposed Action.

3.10.2.3 Livestock Fencing Alternative

Under the Livestock Fencing Alternative, the socioeconomic impacts would be largely indistinguishable from those of the Proposed Action and Reconfiguration Alternative, but there would be a reduced likelihood of accidental impacts to livestock grazing in the surrounding area. The livestock fence would be removed once the mine is reclaimed and revegetation is determined successful by the BLM and NDEP.

3.10.2.4 No Action Alternative

Under the No Action Alternative, current production levels of the Rossi Mine would be expected to be phased out in 2017 and 2018. As shown in **Table 3.10-15** and **Table 3.10-16**, the current contribution of the Rossi Mine to local employment and labor earnings is estimated to be between 0.3 percent and 0.4 percent of the employment and labor earnings of the study area, and approximately 0.6 percent when indirect and induced effects are considered. Impacts on housing and public services would depend on whether current employees directly or indirectly employed by the Rossi Mine would remain in the study area and find alternative employment or would leave the study area, reducing demand for

housing and public services. Current property taxes paid by the Rossi Mine and the Dunphy Mill would be reduced and the increase in sales tax that would be associated with the Proposed Action would not be realized.

3.10.3 Cumulative Impacts

As described in Section 3.10.1, the CESA for socioeconomics is the same as the study area and includes the counties of Elko, Eureka and Lander, and the communities in these counties within commuting distance from the mine and where the project related labor force may reside (**Figure 3.10-1**). The past, present, and RFFAs are discussed in Section 3.2, Past, Present, and Reasonably Foreseeable Future Actions. RFFAs for mining and exploration activities are identified in **Table 3.2-1**; their locations are shown in **Figure 3.2-1** and **Figure 3.2-2**. **Figure 3.2-2** also illustrates some ROW actions.

The socioeconomic effect of past and present actions for the Rossi Mine are reflected in the affected environment described in Section 3.10.1. Therefore, any cumulative effects with the assessed action alternatives are reflected in the discussion of environmental consequences in Section 3.10.2. The discussion below focuses on RFFAs.

As previously discussed, there are two main drivers of socioeconomic impacts associated with the Proposed Action and alternatives: a) increased employment, local expenditures and production; and b) reduced availability of public lands for other uses. RFFAs that would have a cumulative effect on local employment, expenditures and production include mining operations, exploration activities, grazing and agriculture, oil, gas and geothermal leasing and utility and infrastructure development.

BLM (BLM 2012a, BLM 2010c) projected employment at major mines for residents of the Elko Micropolitan Statistical Area (MSA). Employment projections for 2015, 2020, and 2025 are reflected in **Table 3.10-17**. Mining employment is expected to decline through 2025 based on the projections for these major mines. Expansion of the Rossi Mine would be expected to help offset some projected reduction in mining employment from other mines listed in **Table 3.10-17** in 2020 and 2025. Development or expansion of other nearby smaller exploration properties or mines not included in the projections in **Table 3.10-17** also may add to local mining employment and help offset the projected decline in mining employment depending on market conditions.

Table 3.10-17. Projected Employment for Residents of Elko MSA[1] at Mine Facilities in the Carlin Trend and TS Power Plant

Mine	Year 2015		Year 2020		Year 2025	
	Total	*Elko MSA*	*Total*	*Elko MSA*	*Total*	*Elko MSA*
Newmont Carlin Trend (less Midas with Genesis)	1722	1722	788	788	71	71
Barrick Betze Pit	333	320	114	109	14	13
Barrick Meikle	450	432	0	0	0	0
Barrick Overhead and Processing	289	277	218	207	162	155
Barrick Contractor Employees	400	384	200	192	75	72
Barrick Cortez	685	521	155	118	0	0
Newmont Midas[4]	0	0	0	0	0	0
Hollister Underground Mine	216	15	216	15	216	15
Barrick Bald Mountain	260	166	25	16	0	0
Jerritt Canyon	Unk[2]		Unk		Unk	
TS Power Plant	65	46	65	46	65	46
Arturo Mine	358	358	50	50	0	0
Rossi Mine[3]	93	11	383	46	383	46
Totals with Rossi Mine Expansion	**4871**	**4252**	**2214**	**1587**	**986**	**418**
Totals without Rossi Mine Expansion	**4871**	**4252**	**1831**	**1541**	**603**	**372**
Net Due to Rossi Mine Expansion	**0**	**0**	**383**	**345**	**383**	**345**

Sources: BLM 2012a; BLM 2010c; **Table 3.10-14.**

[1] Elko MSA = Encompasses Elko, Spring Creek, Carlin, and the adjacent unincorporated communities in Elko County.
[2] Unk = Unknown
[3] Approximately 88% of the Rossi Mine workforce resides in Battle Mountain in Lander County (HES 2014a).
[4] Currently operated by Klondex Mines Ltd.

In addition to mining, other activities are also expected to contribute to cumulative impacts on employment, expenditures and production. Exploration activities, grazing and agriculture, oil, gas and geothermal leasing and utility and infrastructure construction are expected to continue at levels similar to what occurred in the past.

Past, present, and RFFAs that would have a cumulative effect on the availability of public lands for public uses include mining operations, exploration activities, grazing and agriculture, oil, gas and geothermal leasing, and utility and infrastructure development. Most of these activities are expected to continue at past and present levels, with the possible exception of mining operations, which are anticipated to decline somewhat as some of the major mature mines begin to undergo closure and reclamation.

3.10.4 Potential Monitoring and Mitigation Measures

No monitoring or mitigation measures for socioeconomic impacts are recommended.

3.10.5 Residual Impacts

The socioeconomic effects would last for the duration of the project. Any public and private investment in infrastructure, homes, and businesses from revenues generated by the project would have economic life after the end of the project.

3.11 Recreation and Wilderness

3.11.1 Affected Environment

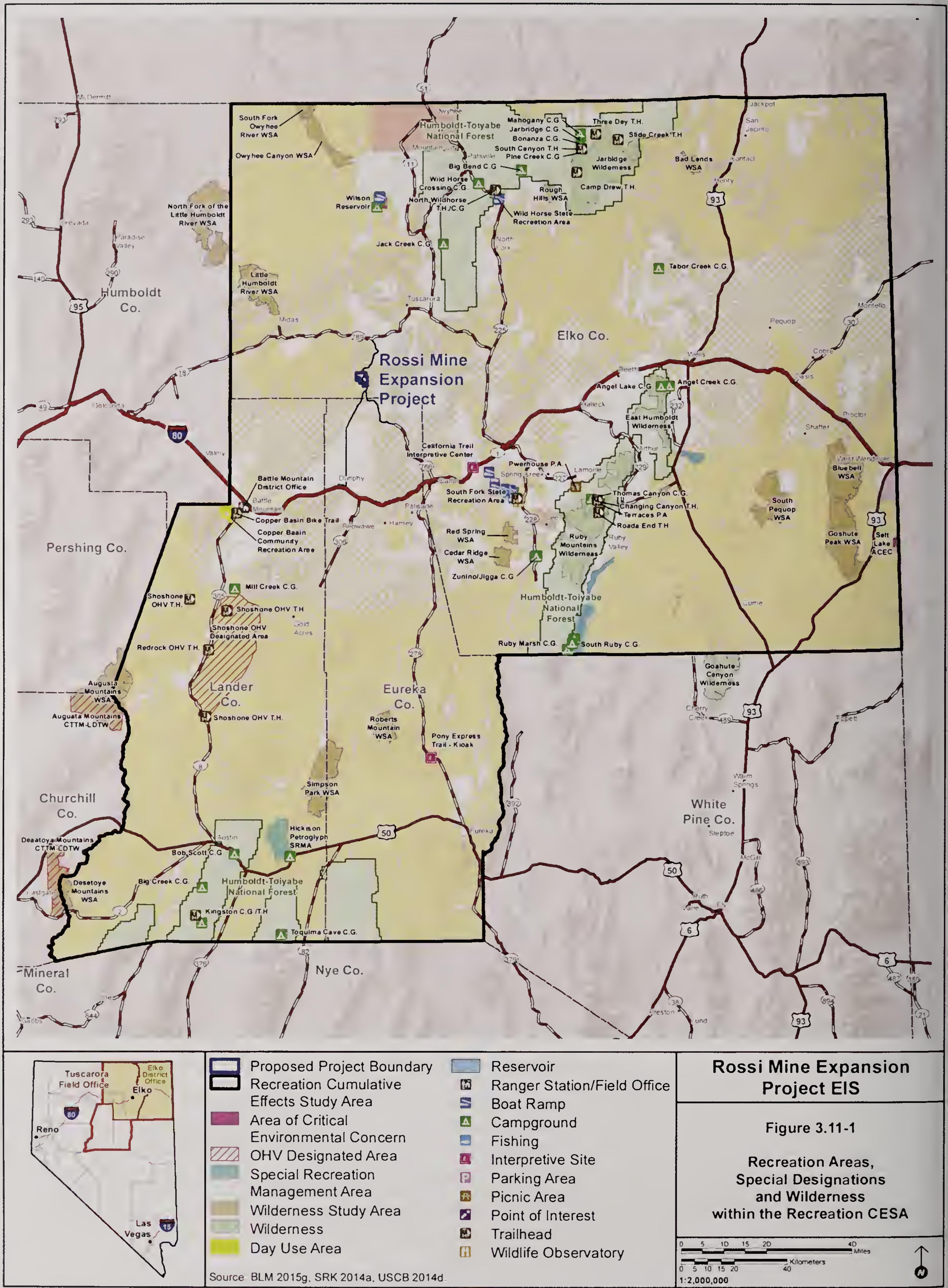
The study area for recreation and wilderness issues is based on the anticipated potential extent of effects from the proposed project. The study area for direct and indirect impacts and CESA for recreation and wilderness comprise Elko, Eureka, and Lander counties as presented in **Figure 3.11-1**. These counties encompass the region in which in the project workforce and their families are likely to live and recreate, as well as the area where the proposed project and past, present, and RFFAs could result in cumulative effects to recreational opportunities or wilderness areas. Due to the large number of recreation and wilderness resources within the study area/CESA, the analysis below focuses on those that are most likely to be impacted by the proposed project.

3.11.1.1 Recreation

Most BLM-administered public lands in the project vicinity are open for dispersed recreational uses, such as hunting, off-highway vehicle (OHV) use, sightseeing, photography, rock hounding, and geocaching. The project vicinity is defined as those areas within 20 miles of the project area. Antelope Creek Road and Boulder Valley Road serve as the primary public access routes for recreational users as well as provide access for ongoing mining activities. BLM-administered lands that are unavailable for dispersed recreational use, which comprise a small percentage of all BLM-administered lands in the area, include isolated parcels with no public access and areas fenced off for protection of the public and to prevent interference with mining activities. Public lands managed by the BLM, federal lands managed by the USFS, USFWS, and Bureau of Indian Affairs, state lands managed by the Nevada State Parks and Nevada Division of Forestry, and privately-owned lands provide additional opportunities for dispersed recreation activities throughout the study area.

No data have been collected to assess past or current levels of recreational use in the project vicinity, but based on the observations of BLM resource specialists, hunting and OHV use are thought to be the most common activities (Setlock 2016). As described in Section 3.17, Wildlife and Aquatic Biological Resources, an important migration route used by the Area 6 mule deer herd connects seasonal ranges found in the vicinity of the existing Rossi Mine. This migration route provides mule deer hunting opportunities in the project vicinity and connected mule deer seasonal ranges. The Rossi PoO area is completely within NDOW hunt management unit 068 while hunt management units 64, 66, and 67 are in the vicinity of the Rossi Mine.

Figure 3.11-1 depicts the location of most developed recreation sites in the study area. There are no developed recreation sites in the immediate project vicinity; however, the study area contains numerous developed recreation sites that provide opportunities for activities such as camping, boating, fishing, mountain biking, white-water rafting, cross-country skiing, and heritage tourism. Willow Creek Reservoir, located approximately 10 air miles northwest of the proposed project, is the nearest developed recreation site. This agricultural impoundment is owned by BGMI and managed by the NDOW, and provides public access for fishing, hunting, boating, and camping. The BLM's California Trail Interpretive Center is located approximately 31 air miles southeast of the proposed project and 8 air miles west of Elko along I-80. The Interpretive Center features dioramas and interactive exhibits, costumed demonstrations of Native American and pioneer life, and a reconstructed Shoshone village and wagon encampment. The South Fork State Recreation Area (SRA), located approximately 40 air miles southeast of the proposed project and 10 air miles south of Elko, provides opportunities for hunting, camping, boating, picnicking, winter sports, and wildlife viewing. The South Fork SRA is managed by Nevada State Parks, features trophy-class trout and bass fisheries. The South Fork canyon area, which lies just west of the South Fork SRA, is managed by the BLM as a Special Recreation Management Area (SRMA). The BLM-operated Copper Basin Mountain Bike Trail system, located approximately 40 air miles southwest of the proposed project and 3 air miles southwest of the community of Battle Mountain, offers a combination of signed single and double track mountain bike trails with varying degrees of difficulty. Wilson Reservoir, located approximately 40 air miles north of the proposed project, is a remote SRMA managed by the BLM to provide opportunities for camping, fishing, boating, picnicking, and hunting.



Rossi Mine Expansion Project EIS

Figure 3.11-1

Recreation Areas, Special Designations and Wilderness within the Recreation CESA

2/20/2018

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Other developed recreation sites located farther from the proposed project include Wild Horse SRA and adjacent Wildhorse SRMA, South Fork Owyhee River SRMA, and Zunino/Jiggs Reservoir SRMA in Elko County; Shoshone OHV Recreation Area and Hickison Petroglyph SRMA in Lander County; and Pony Express National Historic Trail in Eureka County. Various campgrounds, picnic areas, fishing areas, scenic overlooks, and extensive trail systems that provide opportunities for dispersed recreation are located on USFS-managed lands throughout study area, including the Mountain City, Jarbidge, Ruby Mountain, and Austin and Tonopah ranger districts of the Humboldt-Toiyabe National Forest. Most developed USFS recreation facilities in the area are limited to campgrounds with non-flush type toilet facilities.

The towns of Carlin, Elko, Spring Creek, and Battle Mountain have community and commercial recreation facilities. Carlin has a park with ball fields, basketball courts, playground equipment, picnic tables, and a barbeque; an equestrian park; and a motocross park. Elko has rodeo and fairgrounds in addition to seven public parks, ranging from the 0.25-acre Greenbelt Park with a few picnic tables, to the 30-acre Mountain View Park with soccer and ball fields, picnic shelter, and playground. The various parks have an extensive inventory of facilities from barbeque pits and playgrounds to tennis courts and ball fields. Elko also has an 18-hole golf course (Ruby View) and a municipal swimming pool, with both indoor and outdoor pools. The city also provides numerous recreation programs, including ski and snowboard youth programs at the Elko Snowbowl Ski Area approximately six miles north of town. Spring Creek has an 18-hole golf course, a marina, a trap and skeet shooting range, a rifle range, a campground, a sports complex, and a horse palace. Battle Mountain has a nine-hole golf course, mountain bike trails, an outdoor swimming pool, rodeo grounds, camping and fishing areas, gun range, motocross track, a sports complex, and multiple urban parks.

3.11.1.2 Wilderness

Wilderness Areas

There are three designated wilderness areas in the study area/CESA, which are managed by the USFS (University of Montana et al. 2015). **Figure 3.11-1** depicts the location of these wilderness areas in relation to the proposed project.

The 93,000-acre Ruby Mountains Wilderness is located approximately 55 air miles east of the proposed project and was designated by Congress in 1989. The area features glacier-carved valleys and 10 peaks over 11,000 feet, numerous alpine lakes, a large mule deer herd, elk, mountain goats, bighorn sheep, and trout streams. The Ruby Crest National Recreation Trail traverses through the Ruby Mountains Wilderness along the crest of the Ruby Mountains for over 30 air miles.

The Jarbidge Wilderness is located approximately 80 air miles northeast of the proposed project. It was designated by Congress in 1964 and at 110,000 acres, is the second largest wilderness area in Nevada and one of the most remote places in the country. The Jarbidge Wilderness has eight peaks higher than 10,000 feet, numerous creeks and small lakes that provide excellent fishing opportunities, and large elk and deer herds that offer opportunities for hunting and wildlife viewing.

The East Humboldt Wilderness is located approximately 62 air miles east of the proposed project. It was designated by Congress in 1989 and now contains more than 32,000 acres. The area supports a diverse range of vegetation communities, including sagebrush and grasslands that rise to high alpine meadows on the flanks of the 11,127-foot Hole in the Mountain Peak.

Wilderness Study Area

In October 1991, the BLM Nevada State Office released the Nevada BLM Statewide Wilderness Report (BLM 1991c) documenting the rationale and recommendations for 103 Wilderness Study Areas (WSA) throughout the state. All or portions of 16 of these WSAs are located within the study area/CESA **(Figure 3.11-1). Table 3.11-1** identifies the distance of each WSA in the study area to the proposed project and the acreage recommended for wilderness or non-wilderness. Overall, 211,570 acres or 39 percent of WSAs within the study area are recommended for wilderness designation.

Table 3.11-1. Wilderness Study Areas in the Study Area/CESA

Wilderness Study Area	ID	Distance to Project Area (air miles)	Acres Recommended for Wilderness	Acres Recommended for Non-Wilderness
Augusta Mountains	NV-030-108	83.3	0	89,372
Bad Lands	NV-010-184	88.5	8,415	1,011
Bluebell	NV-010-027	108.4	0	55,665
Cedar Ridge	NV-010-088	48.0	0	10,009
Desatoya Mountains	NV-030-110	128.1	43,180	8,222
Goshute Canyon	NV-040-015	105.3	362	0
Goshute Peak	NV-010-033	111.5	61,004	8,766
Little Humboldt River	NV-010-132	22.6	29,775	12,438
North Fork Of The Little Humboldt River	NV-020-827	40.3	8,900	60,783
Owyhee Canyon	NV-010-106	48.0	13,525	8,350
Red Spring	NV-010-091	45.4	0	7,847
Roberts Mountain	NV-060-541	75.7	0	15,090
Rough Hills	NV-010-151	57.9	6,685	0
Simpson Park	NV-060-428	82.7	0	49,670
South Fork Owyhee River	NV-010-103A	60.3	5,180	2,662
South Pequop	NV-010-035	93.8	34,544	6,546
Total	-	-	**211,570**	**336,431**

Source: BLM 2014b.

Lands with Wilderness Characteristics

In 1979, the lands encompassing the project area were evaluated for wilderness characteristics. The Inventory Unit polygons identified and inventoried in 1979 are: Bootstrap (NV-010-123); Checkerboard (NV-010-210); and Wilson (NV-010-211). At that time it was determined that the project area and adjacent areas did not meet the criteria for wilderness characteristics or designation for wilderness because:

- **Bootstrap:** The unit does not meet the basic requirements necessary to be carried over to the intensive inventory stage. Due to lack of topographic and vegetative screening, and the relatively small size, it lacks outstanding opportunities for solitude or a primitive and unconfined type of recreation in comparison to others of its kind.
- **Checkerboard:** None of the public lands, other than a few acres described elsewhere, occur in blocks of more than 5,000 acres each. In fact, most are the size of a single section (640 acres). None of these lands are in areas of sufficient size as to make practicable its preservation and use in an unimpaired condition.
- **Wilson:** None of the public land in the blocks of less than 5,000 acres are of sufficient size as to make practicable its preservation and use in an unimpaired condition (BLM 1979).

BLM Manual 6310 requires the BLM to update or conduct a wilderness characteristics inventory when a project that may impact wilderness characteristics is undergoing NEPA analysis (BLM 2012d). In accordance with this policy, the BLM Tuscarora Field Office delineated two new inventory units that meet the minimum 5,000-acre size threshold for evaluation of wilderness characteristics and overlap the project area: (1) NV-010-123 (21,240 acres) and (2) NV-010-211 (8,388 acres) (Setlock 2016). The BLM completed a wilderness character inventory in August of 2016 and documented the following:

- NV-010-123 Bootstrap

  This unit met the size requirement of 5,000 acres of continuous BLM land but a utility line ROW was present which intersected the entire unit from the south to the north. Due to the presence of this ROW a sub unit, NV-010-123A (Rossi Mine Area 3) was parceled off to the east and inventoried separately per BLM Manual 6310. The sub unit is approximately 5,780 acres in size but did not meet the criteria for naturalness, solitude, and opportunities for unconfined and primitive recreation. The remainder of the unit NV-010-123 Bootstrap is 15,460 acres and is not located in the proposed disturbance boundary. This unit may or may not contain wilderness characteristics and should be inventoried at a later date. See Form 1 and 2 and associated map in Appendix G.

- NV-010-210 Checkerboard

  These small tracts of checker-bordered BLM land intermixed with private parcels failed to meet the size requirements of 5,000 acres or more of continuous BLM land and therefore were dropped from any further inventory.

- NV-010-211 Wilson

  This unit met the size requirement of 5,000 acres of continuous BLM land but the unit has a maintained BLM Road 1059 Squaw Creek which intersects the unit in the center from the south to the north. This road divided the unit NV-010-211 into two separate sub units, NV-010-211A (Rossi Mine Area 1) to the east and NV-010-211B (Rossi Mine Area 2) to the west. Both subunits were inventoried separately per BLM manual 6310 even though both subunits do not meet the size requirement of 5,000 acres of continuous BLM land. Sub-unit NV-010-211A has 360 acres of private inholdings present and subunit NV-010-211B has 232 acres of private inholdings within that unit. In addition both subunits have utility line ROWs that travel across each unit which only serve to diminish the wilderness character not enhance those opportunities. See Form 1 and 2 and associated map in Appendix G.

3.11.2 Environmental Consequences

Primary issues related to recreation resources include increased traffic along Antelope Creek and Boulder Valley roads, which serve as the primary public access routes for recreational uses in the project vicinity, and the potential displacement of mule deer or alternation of mule deer migration patterns, which could impact hunting opportunities in the project vicinity and associated mule deer seasonal ranges.

3.11.2.1 Proposed Action

Recreation

Expansion of existing operations at the Rossi Mine would result in 1,167 acres of new surface disturbance. The Proposed Action would reduce lands available for dispersed recreational activities in the project vicinity until they are reclaimed following the cessation of active mining activities. Hunting and OHV use are the most common dispersed recreational uses in the vicinity of the project area, and are thus the primary activities likely to be adversely affected by these impacts. Because the additional surface disturbance would occur in areas directly adjacent to active mining facilities, where the value of the recreational setting has already been impacted by the presence of existing mining infrastructure and ongoing operational activities, some recreational users may already be avoiding these areas. Therefore, each additional acre of disturbance is likely to have a lower marginal impact on recreation, so long as similar opportunities for dispersed recreational activities are available in nearby areas.

Construction and operational activities that generate noise and dust could degrade recreational settings and experiences in areas beyond the project footprint. The potential for adverse impacts from fugitive dust would be limited by Applicant Committed Environmental Protection Measures, such as the use of wet drilling methods and implementation of road treatments (e.g. water, chemical, gravel, etc.) to control fugitive dust.

The Proposed Action would result in increased traffic along Antelope Creek and Boulder Valley roads, which serve as the primary public access routes for recreational uses in the project vicinity. Recreationists that use these roads to access recreation areas or recreate in areas adjacent to these roads could be adversely impacted by increased traffic, noise, and dust from project-related vehicle trips. Traffic counts conducted by HES on portions of these roads within the mine area determined that traffic from public vehicles accounts for a relatively small proportion of the overall traffic volume in the mine area, although some increases in traffic volume were observed during periods of open big game hunting seasons (SRK 2014a). In addition, HES has committed to reducing vehicle speeds and applying gravel, water, and chemical treatments to roads to minimize fugitive dust emissions. Based on the generally low volume of public vehicles on these roads and implementation of Applicant Committed Environmental Protection Measures presented in **Table 2-16** for fugitive dust control, minimal impacts to public access for recreation are anticipated, with the greatest potential for impacts coinciding with higher volume of public vehicles that utilize Antelope Creek and Boulder Valley roads during open big game hunting seasons in the fall.

As described in Section 3.17, Wildlife and Aquatic Biological Resources, the Proposed Action would constrain or effectively block an important mule deer migration route. Altered mule deer migration patterns and avoidance of the project area due to noise and human presence by mule deer and other big game species could decrease opportunities for hunting in the project vicinity and connected seasonal ranges.

As described in Section 3.10, Social and Economic Values, the Proposed Action would result in a very modest increase in the regional population. The potential for increased demand for recreation resources and opportunities associated with this minor project-related population change is not anticipated to have a notable effect on existing recreation resources and opportunities due to the capacity of most public lands, developed recreation sites, and community parks and recreation facilities in the region to accommodate additional use.

Based on the ample supply of alternative land for dispersed recreation activities in the study area and CESA, the limited potential for project-related population change to affect demand for recreation resources in the region, and because no unique recreation resources would be impacted, overall effects on recreation resources from the Proposed Action would be minor. However, if the Proposed Action results in decreased use or abandonment of the adjacent mule deer migration corridor, there would be adverse effects to big game hunting opportunities in the project vicinity and connected seasonal ranges.

Wilderness

As described in Section 3.8, Air Quality, project-related emissions are not anticipated to result in measurable effects to air quality in wilderness areas or WSAs, the nearest of which is located approximately 23 air miles from the proposed project. Therefore, the effects of the Proposed Action on wilderness resources in the study area would be negligible and in compliance with the Wilderness Act of 1964 and guidance in BLM Manual 6310.

Results of a BLM project-specific wilderness inventory conducted for two new units that partially overlap the project area determined that these areas do not qualify as lands with wilderness characteristics, and no direct or measurable indirect effects would occur to lands with wilderness characteristics.

3.11.2.2 Reconfiguration Alternative

Recreation

Direct and indirect impacts to recreation would be the same as described for the Proposed Action, except for the following:

- There would be approximately 151 less acres of disturbance under the Reconfiguration Alternative. More public lands would be available for dispersed recreational opportunities in comparison to the Proposed Action; however, due to the minor difference in the amount of new surface disturbance, no notable difference in the level of impacts is anticipated.
- The sequencing of construction and final footprint of the modified Dawn WRDF would be configured to ensure the conservation of a minimum 2,000-foot-wide corridor for use by migrating mule deer throughout the life of the project. Maintaining the viability of this migration corridor would reduce the potential for adverse impacts to mule deer hunting opportunities compared to the Proposed Action.

Wilderness

Direct and indirect impacts to wilderness would be the same as described for the Proposed Action.

3.11.2.3 Livestock Fencing Alternative

Direct and indirect impacts to recreation and wilderness would be the same as described for the Proposed Action and the Reconfiguration Alternative. However, the fence would provide a visual boundary defining the mining area. Recreation activities would not be allowed within the fenced area, except to pass through the mine site, until such time as the mine is closed, reclamation is complete, and the BLM and NDEP have determined the closure and reclamation to be successful. The fence would be removed once the mine is reclaimed and revegetation is determined successful by the BLM and NDEP.

3.11.2.4 No Action Alternative

Recreation

Effects of past and ongoing activities at Rossi Mine were addressed in prior environmental analyses listed in **Table 2-1**. Ongoing mining activities at Rossi Mine would continue to exclude lands from dispersed recreational use, including 896 acres of existing authorized surface-disturbance, until they are reclaimed following the cessation of active mining activities. However, the proposed project would not be developed and no additional displacement of dispersed recreational uses; increases in project-related vehicle traffic, noise, and dust; or increased demand for recreation resources would occur. Therefore, impacts from ongoing development at Rossi Mine would be similar to baseline conditions described in Section 3.11.1, Affected Environment, and would gradually diminish with concurrent reclamation, final closure, and final reclamation of the Rossi Mine.

Wilderness

Under the No Action Alternative, there would be no measurable effects to wilderness areas, WSAs, or lands with wilderness characteristics within the study area due to ongoing operation of the Rossi Mine under the terms of current permits and approvals, which are in compliance with the Wilderness Act of 1964 and guidance in BLM Manual 6310.

3.11.3 Cumulative Impacts

The CESA for recreation and wilderness is defined in Section 3.11.1, Affected Environment, and is shown in **Figure 3.11-1**. Past, present, and RFFAs are discussed in Section 3.2, Past, Present and Reasonably Foreseeable Future Actions. RFFAs for mining and exploration activities are identified in **Table 3.2-1**; their locations are shown in **Figure 3.2-1 and Figure 3.2-2**. **Figure 3.2-2** also illustrates some ROW actions.

3.11.3.1 Proposed Action

Recreation

Past and present actions within the CESA have resulted, or would result, in approximately 39,806 acres of surface disturbance from mining exploration and development projects, including sand and gravel operations, as presented in **Table 3.2-1**. RFFAs within the CESA are anticipated to result in an additional 5,567 acres of surface disturbance for a total cumulative disturbance acreage of 45,373 for mining and surface exploration projects. The total proposed and existing/authorized disturbance of 2,063 acres represents 4 percent of the total estimated disturbance from past, present, and RFFAs. This small incremental increase in surface disturbance from the Proposed Action relative to the total land area available for dispersed recreation would result in a minimal effect on existing or potential recreational activities in the CESA.

As described in Section 3.17, Wildlife and Aquatic Biological Resources, past, present, and RFFAs along the Carlin Trend have altered historic mule deer migration patterns. Incremental impacts from the Proposed Action could adversely impact one of the few remaining migration routes still used by mule deer in this area, which could increase the potential for cumulative and synergistic adverse impacts on the regional mule deer population and associated hunting opportunities. However, mule deer would continue to travel around or through the project area.

Wilderness

The Proposed Action would not result in direct or measurable indirect effects on wilderness areas, WSAs, or other lands with wilderness characteristics. Therefore, there would be no cumulative impacts to wilderness resources.

3.11.3.2 Reconfiguration Alternative

Recreation

Cumulative impacts to recreation would be the same as described for the Proposed Action, except there would be fewer incremental impacts from the Reconfiguration Alternative due to 151 less acres of disturbance and the maintenance of a 2,000-foot-wide corridor for use by migrating mule deer, which may reduce the potential for displacement of dispersed recreational uses and adverse impacts to mule deer hunting opportunities compared to the Proposed Action.

Wilderness

Cumulative impacts to wilderness would be the same as described for the Proposed Action.

3.11.3.3 Livestock Fencing Alternative

Cumulative impacts to recreation and wilderness would be the same as described for the Proposed Action and Reconfiguration Alternative.

3.11.3.4 No Action Alternative

Recreation

Under the No Action Alternative, mining and exploration activities would continue as approved under prior authorizations. Effects of the No Action Alternative on recreation resources and opportunities have been addressed in prior environmental analyses of past and present actions and the effects of RFFAs would be addressed through future analyses. A decision not to approve the proposed project would not alter those effects, so there would be no cumulative effects on recreation from the No Action Alternative.

Wilderness

Under the No Action Alternative, there would be no direct or measurable indirect effects on wilderness areas, WSAs, or other lands with wilderness characteristics. Therefore, there would be no cumulative impacts to wilderness resources that could be distinguished from those addressed in prior environmental analyses for past and present actions or to be addressed in future analyses of RFFAs.

3.11.4 Potential Monitoring and Mitigation Measures

No additional monitoring or mitigation measures are recommended for recreation or wilderness.

3.11.5 Residual Impacts

Residual impacts from the proposed project would include minor, localized reductions in the amount of lands available for dispersed recreation activities and a potential loss or displacement of hunting opportunities due to encroachment upon an important mule deer migration corridor. Of the action alternatives, the maintenance of a 2,000-foot-wide migration corridor under Reconfiguration Alternative may result in the least potential for these impacts to occur. Upon successful reclamation of the mine disturbance, approximately 520 acres of proposed and existing/authorized open pits that would not be reclaimed would remain unavailable for recreational use.

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3.12 Visual Resources

3.12.1 Affected Environment

The study area for visual resources encompasses the proposed PoO boundary. Five KOPs have been identified for the project. The CESA encompasses the viewshed of the proposed project and, due to the location of the project on exposed landforms and related potential for extensive visibility, the CESA is defined as the project viewshed out to 10 miles from the study area. The study area, KOPs, and CESA for visual resources are mapped on **Figure 3.12-1** and the KOPs and associated simulations are shown in **Figures B-1** through **B-10** in **Appendix B**. BLM visual contrast rating forms for KOPs 1 through 5 under the Proposed Action and Reconfiguration Alternative are also located in Appendix B.

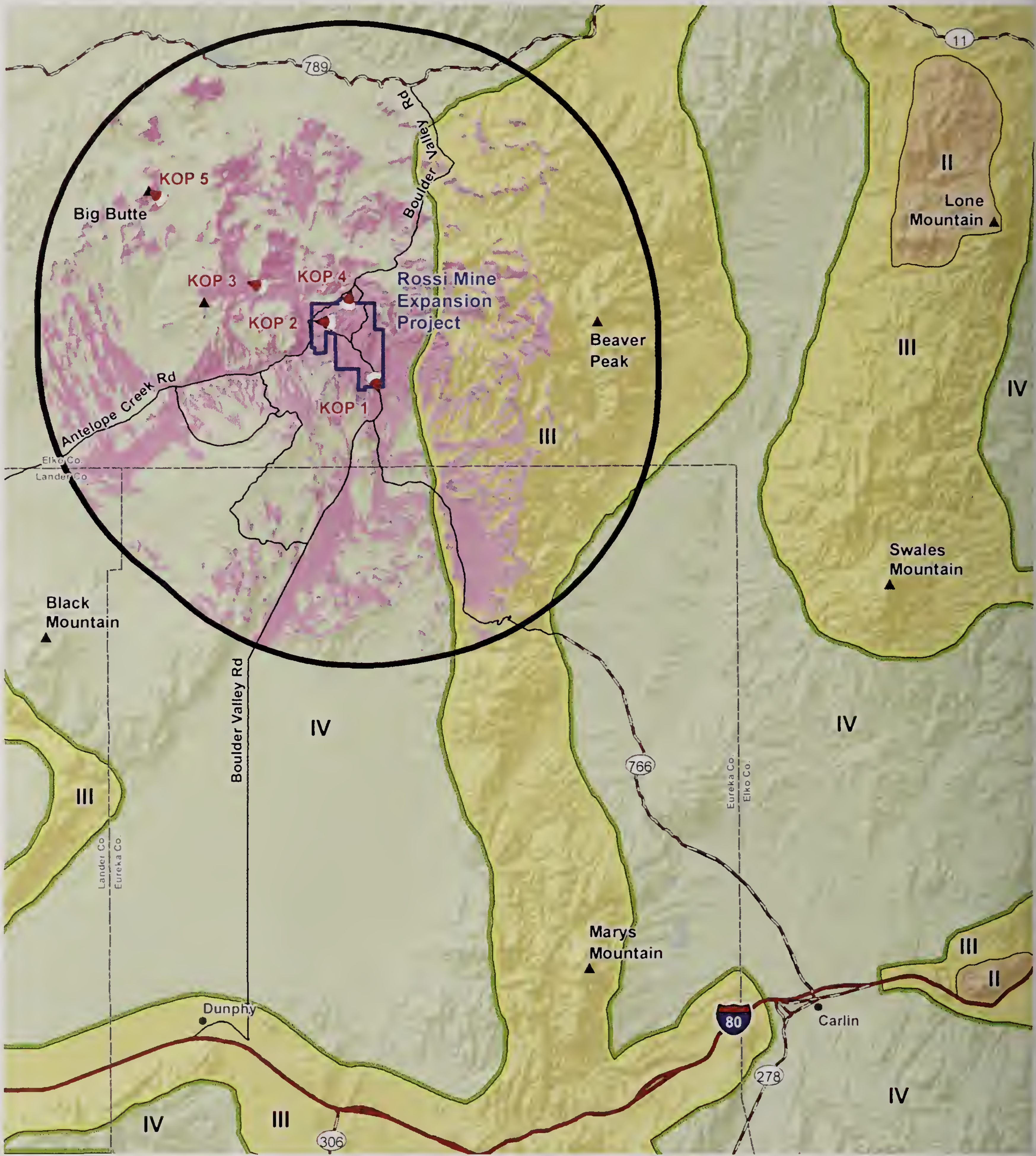
The BLM is required to protect the scenic value of the public lands under its management. BLM uses its Visual Resource Management (VRM) system to inventory, analyze, and manage those resources. **Table 3.12-1** identifies the BLM VRM classes and their associated objectives.

Table 3.12-1. BLM Visual Resource Management Class Objectives

VRM Class	Objective
Class I	The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.
Class II	The objective to this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
Class III	The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
Class IV	The objective of this class is to provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

Source: BLM 1986a.

The Rossi Mine is located in VRM Class IV lands (refer to **Figure 3.12-1**), which generally allow for major modification and high level of change but visual impacts should also be minimized. In addition, the proposed project is visible in the middle-ground (0.5 mile to up to 3 and 5 miles away) from VRM Class III lands associated with Beaver Peak, within the Tuscarora Mountain range, which is located to the east of the project site. Therefore, while mining operations are a part of the existing visual environment, measures should be taken to lessen visual impacts associated with the mine expansion, which are likely to affect nearby recreational viewers and roadway users. Although there are two state scenic routes located east of the city of Elko, there are no officially designated state or local scenic routes in the project area (DOT 2016).



Project Study Area

Visual Resources Cumulative Effects Study Area

Rossi Mine Visibility within 10 Miles

Key Observation Point

Key Summit

Visual Resource Management Classes

Class II

Class III

Class IV

Source BLM 1987a, BLM 2012d, SRK 2014a

Rossi Mine Expansion Project EIS

Figure 3.12-1

Visual Resources Cumulative Effects Study Area and Key Observation Points

0 1 2 3 4 5 Miles

0 1 2 3 4 5 Kilometers

1:350,000

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The landscape of the study area is typical of the Basin and Range Physiographic Province. Key visual features of the native, natural landscape include the gently sloping Beaver Peak to the east, the Sheep Creek Range to the south that converges into the Tuscarora Mountain range, and Santa Renia Mountains to the west. The smooth, rounded terrain of the moderate to steep mountain and hill slopes provide visual interest during different times of the day by creating simple to complex light and shade patterns. This provides visual contrast to the flatter to gently sloping terrain associated with the numerous small valleys that do not cast visually dynamic shadows. Light and shade also affects the perceived color of the terrain by saturating or dulling the color hues present in the landscape (see Existing Conditions in **Figures B-3** and **B-5** in **Appendix B**). In addition, irregular rock outcroppings are scattered throughout the study area and CESA that provide visual contrast and interest from the smoother slopes of the mountains and hillsides.

The study area and CESA is primarily rangeland and is vegetated mostly with grasses, mountain big sagebrush, and low sagebrush (refer to Section 3.14, Vegetation, Including Riparian Zones and Wetland Areas). While this vegetation looks rougher in the foreground, it appears smoother as it recedes into the distance (see Existing Conditions in **Figures B-1, B-2, and B-4** in **Appendix B**). The native landscape coloring is comprised of tans, greyish greens, yellow greens, and greyish browns associated with vegetation and beiges, golds, and dark greys associated with the underlying soils. Rock outcroppings tend to be deep greys and browns, sometimes with a rust colored cast.

The terrain and coloring associated with the mine contrasts to varying degrees with the surrounding native landscape. Interior views of the pits are highly disturbed, with terraced slopes and roadways traveling through the bottom and also angling up the sides of the pit. Interior views are mostly contained by the pit walls and surrounding terrain, which are at a higher elevation than the jig plant and maintenance shop area. Views from the outside, looking toward the WRDF sites, appear less disturbed because the surrounding terrain and WRDF sites obscures interior views of the pits. Waste rock material placed at the WRDF sites falls at the angle of repose and creates steep and straight, angular slopes with flat, horizontal ridgelines that can be seen from the exterior of the pit. The steep, angular slopes and horizontal ridgelines of the WRDF sites contrast against the surrounding native terrain that has gentler slopes and is more rounded and irregular. WRDF sites are unvegetated and the exposed slopes tend to be more reddish brown in color, sometimes intermixed with tans, pinks, golden, and greenish hues (see Existing Conditions in **Figures B-2 and B-4** in **Appendix B**). The regularity of WRDF sites are more apparent in foreground and middle-ground views (see Existing Conditions in **Figures B-2, B-3, and B-4** in **Appendix B**) than in background views (see Existing Conditions in **Figures B-2 and B-4** in **Appendix B**), where they blend in more with the surrounding terrain due to distance.

Numerous drainages flow in little valleys through this hilly terrain including Little Coyote Creek that drains north, Boulder Creek that drains east, and Antelope Creek that drains west of the project site. These valleys also often accommodate local roadways such as Boulder Valley Road and Antelope Creek Road that allow for public access to and through the study area. However, Boulder Valley Road by-passes the east side of the jig plant processing area, and public access to the interior of the pit is restricted. Development in the study area is limited to structures associated with the mine and include two maintenance buildings, the jig plant security office, multiple connex storage boxes, and multiple equipment trailers. These structures tend to be tan, grey, white or lightly colored. While developed areas are small in scale, the use of light colors in building materials make these areas more visually apparent in some locations by contrasting against the darker natural landscape. However, the public cannot see these structures because they are located at a lower elevation within the pit. Post and wire fencing, livestock pens, cattleguards, and lattice steel and wooden poled transmission lines are also located within and near the study area.

Most mining areas are fenced off for protection of the public and to prevent interference with mining activities. However, the Rossi Mine is not. Therefore, most of the study area is visible to the public from Boulder Valley Road and Antelope Creek Road. In addition, views of the study area, the mine, and exploration activities are available from mountain and hills within the study area and CESA that may be used for recreation on BLM-administered public lands. These lands are mostly open for dispersed recreational uses, such as hunting, hiking, trail running, mountain biking, sightseeing, photography, rockhounding, geocaching, and off-highway vehicle use (refer to Section 3.11, Recreation and Wilderness). Big Butte, Black Mountain, Lone Mountain, Mary's Mountain, Beaver Peak, Craig Peak, and

Swales Mountain are of cultural and spiritual significance to Native American Indians in the area, making available views from these peaks sensitive vantage points (refer to Section 3.6, Native American Traditional Values). However, most views are limited to exterior views of the WRDFs and most public visual access to the interior of the mine is limited by terrain.

3.12.2 Environmental Consequences

Impacts to visual resources occur when a proposed project introduces or alters land forms, vegetation, or structures within the characteristic landscape in a manner that would be visually discordant. The level of impact may vary based on the Proposed Action and the proposed changes may or may not be consistent with VRM class objectives (**Table 3.12-1**). In order to analyze visual impacts associated with the proposed project, methods and protocols included in the BLM Visual Contrast Rating Handbook H-8431-1 (BLM 1986a) were used. Visual impacts were determined by evaluating photorealistic simulations prepared for five KOPs to determine visual contrast ratings for existing conditions, proposed post-mining conditions, and proposed reclaimed conditions. The rating process assesses the degree of visual contrast between the existing landscape character under current conditions and the proposed landscape character under post-mining and reclaimed conditions to aid in determining if the Proposed Action would meet VRM Class IV management objectives. The five KOPs used for conducting the impact analysis are mapped on **Figure 3.12-1** and include:

- KOP 1 (**Figure B-1** in **Appendix B**): Located on Boulder Valley Road, just south of the PoO boundary, looking north toward the proposed project. This view is representative of the view for travelers approaching from the south along Boulder Valley Road. Simulations show conditions for the Proposed Action.
- KOP 2 (**Figure B-2** in **Appendix B**): Located just south of Antelope Creek Road looking east toward the proposed project. This view is representative of the view for travelers approaching from the west along Antelope Creek Road.
- KOP 3 (**Figure B-3** in **Appendix B**): Located adjacent to the Mud Springs Road in the Santa Renia Mountains, 2.5 miles from the PoO boundary, looking southeast toward the proposed project. This view is representative of views from the Mud Springs Road and nearby areas that may be used for recreation.
- KOP 4 (**Figure B-4** in **Appendix B**): Located on the transmission line access road, 0.3 miles north of the PoO boundary, looking southwest toward the proposed project. This view is representative of views from nearby hillsides that may be used for recreation.
- KOP 5 (**Figure B-5** in **Appendix B**): Located on Big Butte, 9.3 air miles from the PoO boundary, looking southeast toward the proposed project. This view is representative of culturally sensitive views from nearby peaks. This view was chosen because it is the closest peak with culturally and spiritually sensitive views to Native Americans that would have views of the proposed project, as identified through viewshed modeling (refer to Section 3.6, Native American Traditional Values).
- KOP 1 (**Figure B-6** in **Appendix B**): Same location as shown in **Figure B-1** in **Appendix B**. Simulations show conditions for the Reconfiguration Alternative.
- KOP 2 (**Figure B-7** in **Appendix B**): Same location as shown in **Figure B-2** in **Appendix B**. Simulations show conditions for the Reconfiguration Alternative.
- KOP 3 (**Figure B-8** in **Appendix B**): Same location as shown in **Figure B-3** in **Appendix B**. Simulations show conditions for the Reconfiguration Alternative.
- KOP 4 (**Figure B-9** in **Appendix B**): Same location as shown in **Figure B-4** in **Appendix B**. Simulations show conditions for the Reconfiguration Alternative.
- KOP 5 (**Figure B-10** in **Appendix B**): Same location as shown in **Figure B-5** in **Appendix B**. Simulations show conditions for the Reconfiguration Alternative.

3.12.2.1 Proposed Action

The Proposed Action would result in visible changes to the existing landscape by expanding the existing King Pit, including the associated King North WRDF, and the Queen Lode and QLEE Pits into the QLC Pit; expanding, developing, or modifying existing roads, ancillary support facilities, and ponds for water storage and supply; developing the Dawn Pit and three new WRDFs (QLC North, QLC East, Dawn); installing buried power distribution lines and a short wave/FM radio communications tower; and continued mineral exploration in the project area. New surface disturbance under the Proposed Action would total 1,167 acres. The total surface disturbance would be 2,063 acres for the project when the Proposed Action is added to the existing and authorized disturbance. However, under the Proposed Action, operational lighting, site security, signage, and fencing would be the same as for the existing authorized facilities except that there would be minor additional lighting installed for the new buildings and structures.

Expanding, developing, or modifying existing roads, ancillary support facilities, and ponds for water storage and supply would have little effect on existing visual resources. These elements are an existing visual feature associated with current mining activities and, in an area that is already highly disturbed, slight changes associated with these features would not stand out or substantially increase the visual contrast compared to existing conditions. Similarly, installing 1.5 miles of new, 24.9 kV power distribution lines would also not increase the visual contrast, compared to existing conditions, as all new power distribution lines would be buried in conduit according to industry standards. Site security, signage, and fencing would be the same as for the existing authorized facilities so the visual contrast would not change significantly.

Operational lighting would be installed for the new buildings and structures (permanent and portable office buildings, two vehicle wash facilities, fuel farms, truck scale and scale house, portable storage units, and lined maintenance pad). The lighting that would be used on mobile light plants and equipment, and installed on fixed buildings and structures would be shielded and would face downward, and be directed on to the pertinent site only, and away from adjacent areas as described in the Light Management Plan (HES 2016j) to minimize impacts to the characteristic night sky. Thus, the additional lighting would result in very minimal changes in lighting that would not result in an appreciable increase in nighttime lighting levels nor additional sky glow impacts that would increase visual contrast. Areas of night-time activity, such as star gazing, camping, hiking, dispersed recreation, and driving would not receive higher noticeable changes to the characteristic night sky as a result of the proposed project.

A single short-wave communications tower would be installed upon an unnamed hilltop within the PoO boundary in the southwestern quarter of Section 14, Township 37 North, Range 49 East (**Figure 2-4**). The communication tower would consist of a self-supporting lattice structure approximately 30 feet in height and approximately 18 inches wide (HES 2016k). No guy wires or lights would be installed on the tower and the tower itself would be light gray in color. The communications tower site is located immediately to the north of the existing Coyote Creek communications reflector operated by the Sierra Pacific Power Company (NVN-090441). The addition of the proposed communication tower would result in an incremental increase in visual contrast to observers traveling along the Boulder Valley Road through the northern end of the Rossi Mine PoO boundary. Due to the light color of the proposed tower, the lattice design, and relatively short proposed height, the tower would likely not be visible to observers located more than a few miles from the site. No visual impacts to the existing night sky conditions are anticipated as no lighting is proposed to be installed on the communications tower or at the communications site.

Visible dust seen from blasting and hauling operations are an existing condition that would continue to be visible under the Proposed Action, even with the continued implementation of Applicant Committed Environmental Protection Measures (**Table 2-16**), and would not change the visual contrast. Therefore, the primary visual changes resulting from the Proposed Action would occur through expansion and creation of the open pits and WRDFs and exploration activities throughout the project area. Some of these changes would be partially visible to travelers on the Boulder Valley Road, Antelope Creek Road, Mud Springs Road, and the two-track road along the NV Energy 120 kV transmission line north of the King North WRDF, depending on position and vantage point, as they travel along the outskirts of the mine, and by viewers recreating on nearby hillsides that are at a higher elevation than the mine. Views from other vantages are generally blocked by intervening terrain.

The Proposed Action would increase the size of existing pits and would create the new Dawn Pit. This would result in a larger area of unmined, hilly terrain being excavated and converted to sunken pits compared to existing and near-future conditions due to fulfillment of the approved permit authorization. Like the existing pits, the expanded and new pits would have terraced slopes. This would maintain strong visual contrasts in the forms and lines associated with the pits compared to the native terrain that is irregular and rolling. The color of the exposed pit walls would continue to range in color from being lighter to slightly darker than the surrounding native terrain, for a moderate color contrast. Similarly, there would be a weak texture contrast between the exposed pit walls and native terrain, which are both medium to smooth in texture.

Backfilling the Dawn Pit may reduce the amount of visual disturbance, but the King and QLC Pits would remain and leave prominent landscape scars if not backfilled and reclaimed. Interior views of pits would be partially visible by travelers on the Boulder Valley and Antelope-Boulder Connector Roads as they drive through and along the immediate outskirts of the mine or by viewers recreating on nearby hillsides at a higher elevation than the mine. However, most views toward the interior of the mine would be blocked by the surrounding natural hilly terrain and WRDF landforms.

As a result of increasing the amount of excavation, waste rock placement would result in an expansion of existing WRDFs and the creation of the proposed QLC North, QLC East, and Dawn WRDFs to accommodate excess materials from blasting and mining. Changes associated pit and WRDF expansion and creation would increase the amount of visual contrast between the natural character of the landscape and lands affected by mining activities through the expansion and creation of artificial landforms associated with mining activities. While these changes would increase the visual dominance of pits and WRDFs, their appearance would be visually similar to existing pits and WRDFs in the study area. The expanded and new WRDFs, like the existing WRDFs, would result in weak to moderate visual contrasts due to the steep, angular slopes and horizontal ridgelines that contrast against the rolling terrain of unmined areas.

The color of the exposed WRDF walls would continue to range in color from being lighter to slightly darker than the surrounding native terrain, for a moderate color contrast. Similarly, there would be a weak texture contrast between the exposed pit walls and native terrain, which are both medium to smooth in texture. Color and texture contrasts would improve, post-mining, once the WRDFs are recontoured, reclaimed and revegetated. Slopes would be regraded to blend with surrounding topography, interrupt straight-lined features, and facilitate revegetation.

WRDFs would be recontoured to rounded crests and variable slope angles to resemble natural landforms, to the extent possible. As a result, the visual contrasts from the WRDFs would be reduced after reclamation. WRDF landforms, along with unmined terrain, would aid in blocking many views toward the interior of the mine because they border and hide views of the pits. WRDFs would be more visible than pits and often rise above the surrounding unmined terrain. Visible changes resulting from the Proposed Action would be most visible in the foreground, where distance makes the WRDF landforms more prominent and readily visible (KOPs 1, 2, and 4).

The apparent scale of WRDFs decreases in the middle-ground, because a wider viewshed allows for more of the surrounding terrain to become visible and the WRDFs appear to be comparable in scale to the surrounding terrain (KOP 3). In addition, colors become muted and textures become less discernable in the middle-ground. Background views of the study area make it harder to distinguish the WRDFs from the surrounding natural terrain, resulting in a weak to moderate visual contrast due to distance (KOP 5). Therefore, within the CESA, visual contrast becomes weaker the greater the distance the viewer is away from the study area. These visual contrasts are illustrated in the simulated KOPs.

The Dawn WRDF and a very small portion of the QLC East WRDF would be visible just outside of the PoO boundary, as shown in the simulation for KOP 1 (**Figure B-1** in **Appendix B**). The roadway, signage, and fencing would not be altered and the expanded and new pits and other facilities and features associated with the mine would not be visible because views would be limited by intervening terrain. Therefore, the most prominent feature would be the Dawn WRDF. From this vantage, the WRDF is mounding and introduces a new, large-scale landform where none currently exists, resulting in a moderate form and line contrast during post-mining and reclaimed conditions. There would be weak color and texture contrasts, post-mining, because the exposed material would be fairly consistent with the existing colors and textures in the landscape.

Recontoured and vegetated WRDF slopes would blend well with the surrounding landscape, under reclaimed conditions, resulting in a weak color and texture contrast. The moderate to weak visual contrasts represented in the post-mining and reclaimed condition simulations for KOP 1 would be consistent with short- and long-term VRM Class IV management objectives. However, while the mounded landform of the post-mining and reclaimed conditions blends well with the surrounding unmined terrain, during mining there would be a stronger contrast created by the more angular forms and lines that would be present during active mining under the Proposed Action (refer to the King North WRDF in KOP 4, Existing Conditions, as an example). Even during active mining, the more angular forms would be consistent with VRM Class IV management objectives that allow for a high level of change to the characteristic landscape.

The King North WRDF expansion and the new QLC East WRDF would be visible from KOP 2 (**Figure B-2** in **Appendix B**). The Antelope Creek Connector Road would be realigned, making the alignment of the roadway slightly visible for a weak form, line, color, and texture contrast. The existing utility lines would not be altered and the expanded and new pits and other facilities and features associated with the mine would not be visible because views would be limited by intervening terrain. From this vantage, as seen in the left side of the three visual simulations presented in **Figure B-2** in **Appendix B**, the existing King North WRDF rises above the surrounding terrain. In addition, new landforms associated with the QLC East WRDF would be introduced and visible, as seen in the right side of the three visual simulations presented in **Figure B-2** in **Appendix B**, rising above the unmined terrain.

The form and line of the post-mining and reclaimed WRDF are not as prominent and angular as the existing conditions due to recontouring of slopes post-mining to mimic natural topography to the extent practical. As a result, the visual contrasts from the WRDFs would be reduced after reclamation. There would be weak color and texture contrasts, post-mining, because the exposed material would be fairly consistent with the existing colors and textures in the landscape.

Vegetated WRDF slopes would blend well with the surrounding landscape, under reclaimed conditions, resulting in a weak color and texture contrast. The moderate to weak visual contrasts represented in the post-mining and reclaimed condition simulations for KOP 2 would be consistent with short- and long-term VRM Class IV management objectives. However, while the landform of the post-mining and reclaimed conditions blends well with the surrounding unmined terrain, during mining there would be a stronger contrast created by the more angular forms and lines that would be present during active mining under the Proposed Action (refer to Existing Conditions). Even during active mining, the more angular forms would be consistent with VRM Class IV management objectives that allow for a high level of change to the characteristic landscape.

The King North WRDF expansions and the new QLC East WRDF would be the most prominent features visible in the middle-ground from the Mud Springs Road area in the Santa Renia Mountains, as shown in the simulation for KOP 3 (**Figure B-3** in **Appendix B**). The expanded and new pits and other facilities and features associated with the mine would not be visible because views would be limited by intervening terrain. From this vantage, the WRDFs in the middle-ground are more regular and angular with longer, horizontal ridgelines than the surrounding irregular terrain. The smaller, stepdown landform in front of the larger landform that are both associated with the King North WRDF helps this WRDF to blend better with the surrounding terrain compared to the existing, single WRDF landform. In addition, small portions of King South and QLC East WRDFs would be visible that would blend well with the characteristic landscape.

The form and line of the post-mining and reclaimed WRDFs are not as prominent as the existing WRDF landform due to recontouring of slopes to mimic surrounding natural landform patterns to reduce visual contrasts. There would be moderate color contrast, post-mining, because the exposed material would be more saturated, uniform, and slightly darker than the existing colors in the landscape that are more variable due to slope microclimates and vegetation patterning.

Vegetated WRDF slopes would blend well with the surrounding landscape, under reclaimed conditions, resulting in a weak color contrast. There would be weak texture contrast, post-mining and after reclamation, because the texture of exposed materials and vegetation would be indiscernible at this distance. The moderate to weak visual contrasts represented in the post-mining and reclaimed condition simulations for KOP 3 would be consistent with short- and long-term VRM Class IV

management objectives. At this distance, there would be a similar visual contrast created by the more angular forms and lines that would be present during active mining under the Proposed Action (refer to Existing Conditions), which would be consistent with VRM Class IV management objectives that allow for a high level of change to the characteristic landscape.

The King North WRDF would be visible just outside of the northern PoO boundary, as shown in the simulation for KOP 4 (**Figure B-4** in **Appendix B**). The power line road and transmission lines would not be altered and the expanded and new pits and other facilities and features associated with the mine would not be visible because views would be limited by intervening terrain. Therefore, the most prominent feature would be the King North WRDF. From this vantage, the post-mining and after reclamation WRDF visual simulation shows reduced form and line visual contrasts due to recontouring of slopes to blend in with the surrounding topography compared to existing conditions. There would be weak color and texture contrasts, post-mining, because the exposed material would be fairly consistent with the existing colors and textures in the landscape.

Vegetated WRDF slopes would blend well with the surrounding landscape, under reclaimed conditions, resulting in a weak color and texture contrast. The moderate to weak visual contrasts represented in the post-mining and reclaimed condition simulations for KOP 4 would be consistent with short- and long-term VRM Class IV management objectives. However, while the landform of the post-mining and reclaimed conditions blends fairly well with the surrounding unmined terrain, during mining there would be a stronger contrast created by the more angular forms and lines that would be present during active mining under the Proposed Action (refer to the WRDF in KOP 4, Existing Conditions). Even during active mining, the more angular forms would be consistent with VRM Class IV management objectives that allow for a high level of change to the characteristic landscape.

The King North WRDF expansion and the new QLC East and QLC North WRDFs would be the most prominent features visible in the background from Big Butte, as shown in the simulation for KOP 5 (**Figure B-5** in **Appendix B**). The expanded and new pits and other facilities and features associated with the mine would not be visible because views would be limited by intervening terrain. While harder to see from this vantage, the WRDFs in the background are still more regular and angular with longer, horizontal ridgelines than the surrounding irregular terrain. While the form and line of the post-mining and reclamation WRDF are not as prominent as the existing, there would still be a moderate form and line contrast because the WRDF slopes would be more horizontal and vertical than the unmined, undulating terrain. There would be moderate color contrast, post-mining, because the exposed material would be more saturated, uniform, and slightly darker than the existing colors in the landscape that are more variable due to slope microclimates and vegetation patterning.

Vegetated WRDF slopes would blend well with the surrounding landscape, under reclaimed conditions, resulting in a weak color contrast. There would be weak texture contrast, post-mining and after reclamation, because the texture of exposed materials and vegetation would be indiscernible at this distance. The moderate to weak visual contrasts represented in the post-mining and reclaimed condition simulations for KOP 5 would be consistent with short- and long-term VRM Class IV management objectives. At this distance, there would be a similar visual contrast created by the more angular forms and lines that would be present during active mining under the Proposed Action (refer to Existing Conditions), which would be consistent with VRM Class IV management objectives that allow for a high level of change to the characteristic landscape.

Under the Proposed Action, exploration would continue throughout the project area as described in Section 2.3.10, Exploration. Direct impacts to visual resources from exploration would include short-term loss of approximately 67 acres. Locations of future exploration activity depend upon the results of drilling activity; therefore, specific locations that would be impacted cannot be identified. Indirect impacts resulting from exploration activities would include increased fugitive dust, vibration, and localized soil compaction during road and pad construction and active drilling operations. Exploration would also result in an increase of fragmentation of the existing vegetation communities within the project area. Increased fragmentation of existing vegetation communities would result in minor impacts to visual resources through the minor increase of visual contrasts experienced by an observer.

Overall, existing, post-mining, and reclaimed conditions would meet VRM Class IV management objectives. In addition, recontouring of slopes to provide rounded edges and undulating topography where practical to blend in to the surrounding natural landforms, and vegetating exposed slopes with natural vegetation during reclamation would aid in reducing visual contrasts.

The Proposed Action would also be visible from VRM Class III lands, which is located approximately 0.75 mile from the PoO Boundary at its closest point. This is farther away than KOP 4 that is 0.3 miles away and closer than KOP 3 that is 2.5 miles from the PoO boundary. Both of these views have moderate to weak visual contrasts in the post-mining and reclaimed conditions that would be consistent with short- and long-term VRM Class IV management objectives. VRM Class III management objectives allow for a moderate level of change and, therefore, the Proposed Action would also be consistent with these objectives.

3.12.2.2 Reconfiguration Alternative

The Reconfiguration Alternative is the same as described for the Proposed Action with the following exceptions: the Dawn and QLC North WRDFs would have modified and smaller footprints, and QLC East WRDF would have a modified, slightly larger footprint, and the eastern portion of the QLC Pit would be completely backfilled (**Figure 2-7**). Overall, this alternative would generally result in reducing the amount of visual disturbance and contrasts in those areas. Under this alternative, the King North WRDF and King Pit would have the same visual contrast compared to the Proposed Action, as shown in the simulations for the Reconfiguration Alternative. While the QLC East WRDF would be slightly larger under this alternative, it would be visually similar and result in a very similar visual contrast compared to the Proposed Action.

As shown in **Figure B-6** in **Appendix B**, the Dawn WRDF would still be visible from KOP 1 but would appear slightly smaller (due to further distance from the KOP) and slightly more geometric, with more angular slopes and rounded corners, compared to the Proposed Action that has a more rounded form. In addition, a very small portion of the QLC East WRDF would also be visible under this alternative, similar to the Proposed Action. The reclaimed conditions are comparable to the Proposed Action. As shown in **Figure B-7** in **Appendix B**, in the left of the simulations, views of the King North WRDF would look the same under this alternative as under the Proposed Action. The existing King South WRDF and the new QLC North WRDF would combine together under the Reconfiguration Alternative, and would still be visible from KOP 2. In addition, the QLC East WRDF would also be visible and appear almost the same as under the Proposed Action. The main difference is that the King South and QLC North WRDFs would appear as a very slight jog in the peak line that would not alter the visual contrast compared to the Proposed Action. As shown in **Figures B-8 through B-10** in **Appendix B**, KOPs 3 through 5 would have no noticeable changes from these vantages when compared to the Proposed Action. From a distance, changes associated with the Reconfiguration Alternative would not be evident in KOPs 3 and 5 and this alternative would look the same as under the Proposed Action. From KOP 4, differences associated with the Reconfiguration Alternative would not be visible behind the King North WRDF from this location. Overall, KOPs 1 through 5 would have the same visual contrast under the Reconfiguration Alternative as under the Proposed Action.

Overall, this alternative would result in slightly smaller areas of disturbance west of the QLC East WRDF and south of the Dawn WRDF but, like the Proposed Action, would also result in weak to moderate visual contrasts in form, line, color, and texture. As with the Proposed Action, post-mining and reclaimed conditions of the WRDF terrain would blend better with the characteristic landscape than existing and proposed active mining conditions and the Reconfiguration Alternative would comply with VRM Class IV management objectives and the nearby VRM Class III management objectives. WRDFs would be graded to mimic the nearby existing landform pattern to the extent possible, and exposed slopes would be reclaimed with natural vegetation to reducing visual contrasts.

3.12.2.3 Livestock Fencing Alternative

Under the Livestock Fencing Alternative, all aspects of the Proposed Action and Reconfiguration Alternative would remain the same except that three or four strand, wildlife friendly livestock exclusion fence would be installed around the perimeter of the mine facilities as shown in **Figure 2-15**. Therefore,

the visual conditions shown in the visual simulations would not be greatly altered because the proposed WRDF sites and access roads would not change under the Livestock Fencing Alternative. As shown on **Figure 2-12**, there is already existing fencing along the mine boundary on either side of the cattleguard at Boulder Valley Road that would be utilized under this alternative so that there would be no change in the visual contrast of the proposed project as seen from KOP 1 (**Figure B-1** in **Appendix B**) compared to the Proposed Action. In addition, there would be no change in the visual contrast of the proposed project seen from KOPs 3 and 5 (**Figures B-3 and B-5** in **Appendix B**) because the fence would not be visible at these distances. There would be very little change in the visual contrast of the proposed project seen from KOPs 2 and 4 (**Figures B-2 and B-4** in **Appendix B**) with the inclusion of the fence. Livestock exclusion fencing is an existing visual element in the study area and new fencing would not be prominent enough in form, line, color, or texture as to introduce a visually discordant feature in the landscape (refer to KOP 1). As such, the fencing would not detract from views or substantially affect the visual character. Fencing would also be consistent with VRM Class IV management objectives. As a result, visual impacts would be the same than those identified for the Proposed Action and the Reconfiguration Alternative. The fence would be removed once the mine is reclaimed and revegetation is determined successful by the BLM and NDEP.

3.12.2.4 No Action Alternative

Under the No Action Alternative, mining activities would continue under the existing permit authorization but the proposed project would not be developed. Upon closure of the mine, reclamation activities associated with existing mine disturbance and surface exploration areas would occur under the existing permit authorization. However, additional impacts to visuals resources associated with the Proposed Action, Reconfiguration Alternative, and the Livestock Fencing Alternative would not occur. Because mining is an existing approved action in the study area, the visual effects of the No Action Alternative are considered to be minimal and consistent with VRM Class IV management objectives.

3.12.3 Cumulative Impacts

The CESA for visual resources is defined in Section 3.12.1, Affected Environment, and mapped on **Figure 3.12-1**. The past, present, and RFFAs are identified and discussed in Section 3.2, Past, Present, and Reasonably Foreseeable Future Actions. RFFAs from mining and exploration activities are included in **Table 3.2-1**; their locations are shown in **Figures 3.2-1 and 3.2-2**. **Figure 3.2-2** also illustrates some ROW actions.

3.12.3.1 Proposed Action

Visual effects of past and present actions are included in the description of the Affected Environment, Section 3.12.1. RFFAs that would result in visual effects within the CESA are projects that result in built structures such as the TS Power Plant and Bell Creek Substation, pipeline and utility corridor projects, and exploration and development projects associated with mining. Temporary and permanent built structures are common in the CESA due to past and present mining activities. Ancillary facilities associated with the Proposed Action are minimal and would not compound visual effects. Similarly, as described in Section 3.12.2.1, the new distribution lines associated with the Proposed Action within the PoO boundary would be minimal and would not compound visual effects when factored with other pipeline and utility projects that are occurring and are likely to occur within the CESA. Mining projects would be the most likely to compound visual effects and increase visual contrast within the CESA by increasing surface disturbances and creating new landforms. In addition, the visual presence of dirt roads would likely increase within the CESA to provide access to past, present, and RFFA projects. However, the CESA is comprised of VRM Class III and VRM Class IV lands that provide for moderate and high levels of change in the landscape. Therefore, it is anticipated that the visual disturbances within the CESA would meet VRM Class III and Class IV management objectives, assuming that past, present, and RFFA projects would be required to implement reclamation plans or additional measures to minimize visual effects as a part of their current or future permit authorizations.

Existing, post-mining, and reclaimed conditions associate with the Proposed Action would meet VRM Class III and Class IV management objectives even though the post-mining and reclaimed conditions of

the WRDF terrain blend better with the characteristic landscape than the existing active mining conditions blend. In addition, recontouring of slopes to blend with the natural topography, and vegetating exposed slopes with natural vegetation during reclamation would aid in reducing visual contrasts and cumulative effects. The VRM Class III management objective establishes that “changes should repeat the basic elements found in the predominant natural features of the characteristic landscape” and the VRM Class IV management objective establishes that “every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.”

3.12.3.2 Reconfiguration Alternative

While there would be a slight decrease in visual contrasts in the CESA under the Reconfiguration Alternative, cumulative effects would be similar to those associated with the Proposed Action. Therefore, this alternative would meet the standards associated with VRM Class III and Class IV management objectives. The same mitigation measure would aid in further reducing cumulative visual effects associated with this alternative.

3.12.3.3 Livestock Fencing Alternative

Cumulative effects under the Livestock Fencing Alternative would be the same as described for the Proposed Action and Reconfiguration Alternative because livestock exclusion fencing is an existing visual element in the CESA and new fencing would not be prominent enough in form, line, color, or texture as to introduce a visually discordant feature in the landscape. As such, the fencing would not detract from views or substantially affect the visual character or result in increased visual contrasts in the CESA.

3.12.3.4 No Action Alternative

Under the No Action Alternative, the proposed project would not be developed and additional impacts to visual resources would not occur.

3.12.4 Potential Monitoring and Mitigation Measures

Implementation of concurrent reclamation, as described in Section 2.3.12, during operations benefits the closure and reclamation process, begins to establish vegetation on reclaimed areas that are no longer active, and lessens the visual impacts of the mine site. Regrading and reshaping earthwork activities of reclamation change the lines and forms of the facilities to blend with the natural topography by rounding and softening the sharp or angular edges. Seeding the regraded and reshaped facilities begins to re-establish vegetation which also blends the colors and textures into the natural terrain. No monitoring or additional mitigation would be necessary.

3.12.5 Residual Impacts

The proposed project would not cause residual impacts since the proposed project would comply with the Class IV objective during active mining and after reclamation.

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3.13 Soils and Reclamation

3.13.1 Affected Environment

The study area for soils and reclamation encompasses the proposed project area or area within the proposed PoO boundary. The CESA for soils and reclamation is defined as the Rock Creek Valley and Boulder Flat hydrographic basins (**Figure 3.13-1**). The CESA was selected based on the location of the proposed project within these hydrographic basins.

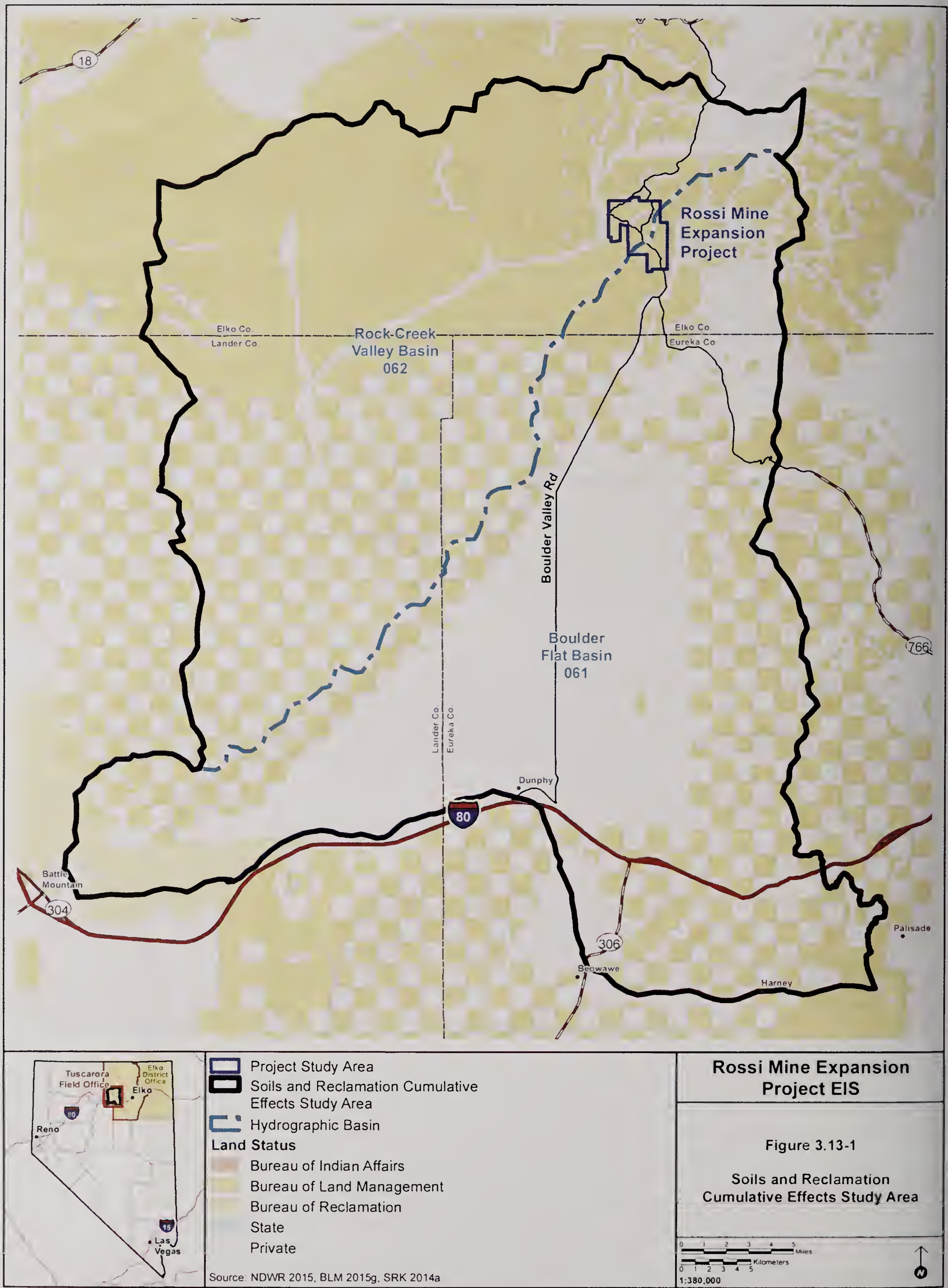
Structurally, the proposed project lies within the Great Basin Section of the Basin and Range Province of the Intermountain Plateaus. It also lies within the Owyhee High Plateau Major Land Resource Region (NRCS 2006). Soils within the study area are primarily derived from volcanic rock and to a lesser extent from sedimentary rock. They developed on lower mountain slopes and hills.

The soil information for the study area is based on Soil Survey Geographic database review and analyses (NRCS 2015a), the Soil Survey of Northwest Elko County Area, Nevada, (NRCS 1986), the Soil Survey Tuscarora Mountain Area, Nevada (NRCS 1968), the Rossi Mine Expansion Project Soils, Vegetation, and Wildlife Baseline Report (SRK 2013b), and the Rossi Mine Expansion Plan of Operations (NVN-070547) and Reclamation Permit Application (No. 0257) (SRK 2014a). The distribution of soils within the proposed study area is illustrated in **Figure 3.13-2**.

Soils in the study area are characteristically moderately deep (i.e., 25 to 36 inches) to deep (i.e., 36 to 60 inches). Soils along ridge tops and slopes tend to be shallow and are intermixed with gravel, cobble, and stone rock fragments. Most of the soils in the study area have clay subsoils that are moderately prone to shrink-swell. Water erosion hazard ranges from slight to moderate. The soils in the study area range from slightly acidic to slightly alkaline.

3.13.1.1 Project Area

The physical and chemical characteristics and reclamation suitability of soil map units that have been mapped within the project area are summarized in **Table 3.13-1**. A portion of the project area has been previously disturbed by historic mining activities. Where previous mining disturbance has occurred, soils that have been reclaimed are considered anthropogenically altered (i.e., altered by man) and may not match the current soil survey descriptions.



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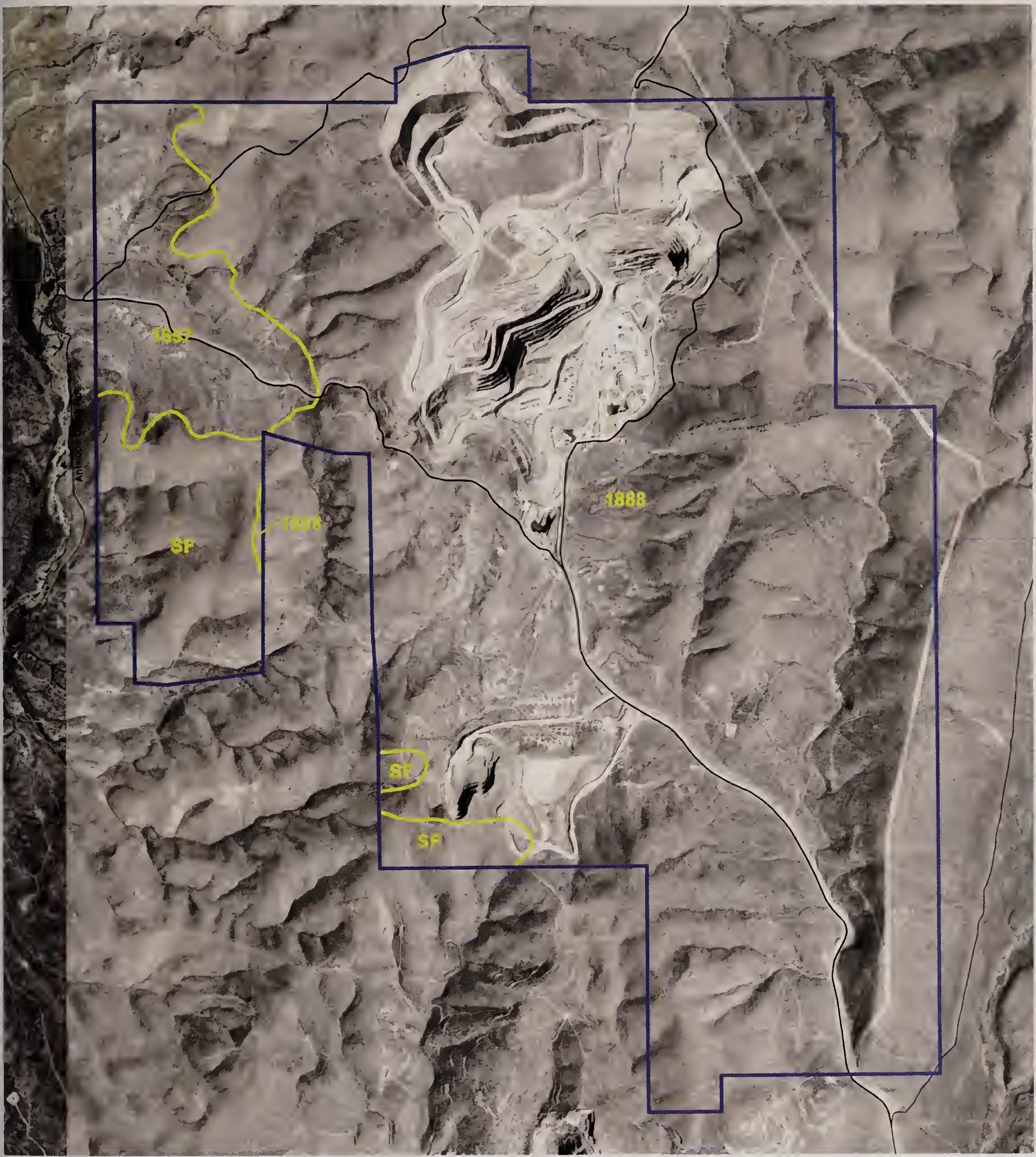
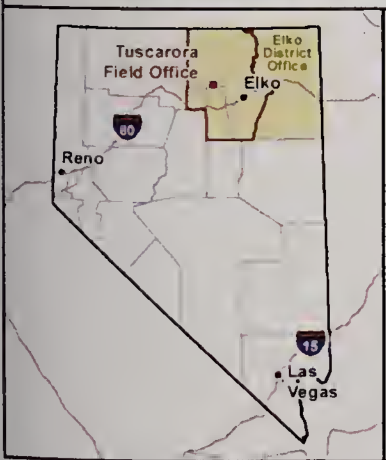




Project Study Area

Soil Map Units

1657 - Ninemile-Alyan association

1888 - Chen-Pie Creek-Alyan association

SF - Slaven-Ramires association

Source: SRK 2014a, NRCS 2015a

Rossi Mine Expansion Project EIS

Figure 3.13-2

Soil Types Within the Project Study Area

0 0.1 0.2 0.3 0.4 0.5 Miles

0 0.25 0.5 0.75 1 Kilometers

1:30,000

N

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data
Original data were compiled from various sources. This information may not meet National Map Accuracy Standards
This product was developed through digital means and may be updated without notice.

2/20/2018

The study area is dominated by three soil associations. The Slaven-Ramires association (Map Unit SF) covers approximately 8 percent of the study area. The Slaven soils are moderately deep soils that occur on hills and mountain side slopes. The soil profile is very to extremely gravelly to lithic bedrock. The Slaven-Ramires soils are poorly suited for rangeland seeding because of the gravelly surface layer and steepness of slope. Water percolates slowly into this soil, affecting irrigation.

The Chen-Pie Creek-Alyan association (Map Unit 1888) covers approximately 84 percent of the study area. The Chen-Pie Creek-Alyan soils are moderately shallow soils that occur on hills and in drainages. The top 5 to 9 inches of this association range from gravelly loam to very cobbly loam. This upper sequence is underlain by 7 to 9 inches of clay, very gravelly clay, or very cobbly clay. The depth to lithic (hard) bedrock is between 12 and 40 inches below ground surface. The Chen-Pie Creek-Alyan soils are poorly suited for rangeland seeding because of droughty soils (subject to excessive drainage). The primary constraint on Chen-Pie Creek-Alyan soils for rangeland seeding is rooting depth, which is not relevant for soils that are stockpiled as growth media. Drainages, rock outcrops, and some of the hills have shallow soils; water percolates slowly into these soils, affecting irrigation.

The Ninemile-Alyan association (map unit 1657) covers approximately 8 percent of the study area. The Ninemile-Alyan soils are moderately shallow soils occur on hills and in drainages. The top 9 inches of this association are gravelly loam. This upper sequence is underlain by 5 inches of clay and a subsequent five inch layer of gravelly clay. Depth to lithic (hard) bedrock is between 10 and 40 inches below ground surface. The primary constraint on Ninemile-Alyan soils for rangeland seeding is rooting depth, which is not relevant for soils that are stockpiled as growth media. Water percolates slowly into this soil, affecting irrigation. Refer to **Table 3.13-1** for a description of these soils.

Table 3.13-1. Soil Map Units within the Study Area

Map Unit Symbol	Map Unit Name	Acres	Water Erosion Hazard	Wind Erosion Hazard	Low Reclamation Potential[1]	Hydric	Compaction Prone[2]	Shallow Bedrock[3]	Stony-Rocky[4]	Droughty[5]
1657	Ninemile-Alyan Association	286	Slight	Low	no	no	no	no	no	no
1888	Chen-Pie Creek-Alyan Association	3,157	Moderate	Low	no	no	no	no	no	yes
SF	Slaven-Ramires Association	299	Moderate	Low	no	no	no	no	yes	no

Sources: NRCS 1968; NRCS 1986; NRCS 2015a.

Water erosion hazard class determined from Soil Erodibility Factor (Kw) for surface horizons and slope.

[1] Low Reclamation Potential = Soils with high strong acidity, strong alkalinity, salinity, or sodic properties.
[2] Compaction Prone = Surface is sandy clay loam or finer.
[3] Shallow Bedrock = Soils with lithic (hard) bedrock at 60 inches or less.
[4] Stony-Rocky = Soil profile has large stones or rocks that may pose reclamation or excavation challenges.
[5] Droughty = Soils with a surface texture of sandy loam or coarser that are moderately well to excessively drained.

3.13.2 Environmental Consequences

3.13.2.1 Proposed Action

Primary issues related to soils and reclamation are the following:

- soil erosion resulting from wind and water
- soil sedimentation as a result of water erosion
- soil compaction, rutting, and pulverization
- changes in soil texture and structure
- soil contamination
- availability of suitable soils and growth media for revegetation
- potential for restoring land uses after mine closure
- mine site stabilization
- protection of public and environmental safety after mine reclamation and closure

A total of 2,063 acres would be disturbed under the Proposed Action: 1,167 acres of new disturbance and 896 acres under existing authorizations. Under the Proposed Action, exploration would continue throughout the project area as described in Section 2.3.10, Exploration. Direct impacts to soil resources from exploration would include short-term loss of approximately 67 acres. Locations of future exploration activity depend upon the results of drilling activity, therefore specific locations and soil types that would be impacted cannot be identified. Indirect impacts resulting from exploration activities would include increased fugitive dust, vibration, and localized soil compaction during road and pad construction and active drilling operations. Exploration would also result in an increase of fragmentation of the existing soil units within the project area.

Reclamation Requirements

Under BLM 3089 regulations (43 CFR Subpart 3809.420), reclamation practices for mining projects on public lands are required to include several factors including:

- At the earliest feasible time, the operator shall reclaim the area disturbed, except to the extent necessary to preserve evidence of mineralization, by taking reasonable measures to prevent or control onsite and offsite damage of the Federal lands;
- Saving of topsoil for final application after reshaping of disturbed areas have been completed;
- Measures to control erosion, landslides, and water runoff;
- Measures to isolate, remove, or control toxic materials;
- Reshaping the area disturbed, application of the topsoil, and revegetation of disturbed areas, where reasonably practicable; and
- Rehabilitation of fisheries and wildlife habitat.

As discussed in Section 2.3.11, Growth Media Stockpiles, as mining progresses, soil would be salvaged, consistent with current operations, placed in stockpiles within the authorized disturbance area, and retained for subsequent use in reclamation. Jig tail fines also would be used as growth media to supplement salvaged topsoil for reclamation as described in Section 2.3.12.4, Cover Material. To minimize wind and water erosion, the stockpiles would be contoured up to slopes of 2.5H:1V (2.5 units horizontal per 1 unit vertical) and to meet an overall 3:1 slope. Growth media stockpiles would be seeded with an interim seed mix to compete with cheatgrass and keep the soil viable for plant growth.

Reclamation would occur after mining operations are complete in areas where surface disturbance has occurred within the project area including haul roads, drill pads, ancillary facilities, WRDFs, and the jig plant processing area. HES would retain the currently authorized option to partially backfill the King,

Queen Lode, and QLEE pits. Open pits may or may not be reclaimed, with the exception of the proposed Dawn Pit, which would be completely backfilled and recontoured once the mining activity has been completed.

Soil Impacts

Erosion could lead to an overall loss of soil at the reclamation site. Erosion is a concern on stockpiles as well as on any area where soil becomes exposed to erosive forces such as water and wind, e.g., on dirt roads and exposed cuts. Soils subject to water erosion and associated soil sedimentation include those with a silty or fine sandy texture; high inorganic content; poor soil structure; low soil permeability; exposed surfaces including low vegetative cover; and steep topography. Soils subject to wind erosion include those with a silty or fine sandy texture; with irregular and dry surfaces; and with exposed surfaces (lack of shelter from the wind source), including those with low vegetative cover. The erosion potential for soils in the study area is shown in **Table 3.13-1.**

At the Rossi Mine, erosion could occur during mining activities when soils and subsoils are exposed. Steep cuts would expose subsoils to both wind and water erosion. As part of mining activities, soil would be removed and placed in stockpiles, where soil would be vulnerable to both wind and water erosion until vegetative cover is established with the interim seed mix. The creation of roads and tracks clears vegetation, making dirt surfaces, such as road shoulders or dirt tracks, vulnerable to both water and wind erosion. Erosion could also occur in the early stages of reclamation, after the growing media are distributed but before vegetative cover is established. Applicant Committed Environmental Protection Measures for soil resources presented in **Table 2-16** of this EIS and the Rossi Mine Reclamation Plan include BMPs to control water erosion, runoff, and sediment transport including the installation and maintenance of water bars, diversion ditches, sumps, interim seeding of growth media stockpiles and select berms, certified weed-free straw bales, silt fences, and rock and gravel cover. Stormwater diversions and basins would be designed to the 100-year, 24-hour storm.

Soil compaction results when soil particles are compressed by an applied load; as a result of the applied load, the pore spaces between the particles decreases and the bulk density increases. Compaction reduces water infiltration and aeration, and results in excessive water runoff and erosion, as well as less availability of water and air to plant roots. The result of reduced infiltration and aeration is lower growth rates. Soil rutting is a specific kind of soil compaction. It results from the passage of a vehicle or equipment over vulnerable soil. In addition to soil compaction impacts, rutting also affects surface hydrology of the site and the rooting environment. Rutting physically severs roots as well as affecting infiltration and aeration.

At the Rossi Mine, placement and movement of heavy equipment could cause soil compaction and rutting, making these areas more susceptible to erosion and decreasing their suitability for revegetation. During reclamation, roads would be ripped, reshaped, regraded, and re-contoured. After re-contouring, growth media would be placed and the area would be seeded. Drainage features may be retained as needed. After reclamation, roads would blend with the surrounding topography.

Growth media excavation, transport, storage, and redistribution alter the existing soil structure and biome, causing adverse impacts to aeration and permeability. Texture is disrupted during excavation. Some mixing of textural zones occurs; zones with different chemical properties are mixed, creating adverse chemical impacts on soil quality for seedbeds. The biological crust may be buried during stockpiling, causing existing microbial populations to decrease during growth media stockpiling and storage. Due to these effects, the soil quality of growth media is less than that of the native soil resources.

At the Rossi Mine, the stockpiled growth media would be used for ongoing reclamation as mining activities come to completion, rather than all reclamation activities being performed at once. This allows an opportunity for testing revegetation success and adapting approaches as needed. Further, after growth media is placed and vegetation is re-established, the soil quality would improve over time. The post-reclamation monitoring and maintenance program (described in Section 3.13.4, Potential Monitoring and Mitigation) would ensure that vegetation is established before reclamation is considered complete.

Surface mining alters topography, creating deep pits where material is removed, hills where waste material is placed, and ponds where jig tailing fines are deposited and produced from ore processing activities. Deep open pits can capture precipitation, forming temporary shallow ponds; pose a hazard to wildlife and people; and interfere with migration patterns. Stockpile mounds can become a source of erosion and, depending on placement, can interfere with wildlife migration patterns. Jig ponds are typically constructed in areas that do not naturally collect surface water runoff.

As discussed under the Reclamation Requirements section, HES would retain the currently authorized option to partially backfill the King, Queen Lode, and QLEE pits. Open pits would not be reclaimed, with the exception of the proposed Dawn Pit. Upon completion of mining activities, the Dawn Pit would be backfilled and contoured to be congruent with surrounding topography. Six inches of growth media would be placed in areas needing growth media, and the area would be seeded. Jig ponds would be drained and re-contoured so as not to retain rainwater and snowmelt. The Dawn Pit, WRDFs, and jig ponds would be designed to be consistent with the surrounding topography after reclamation.

Soil contamination could result from material spills during mining activities. If large spills occur, contamination could result in the removal and disposal of large amounts of soil. The risk of unanticipated chemical releases is discussed in Section 3.7, Hazardous Materials and Solid Waste. HES has a plan to supplement native soils with jig fines and other sources, discussed below under Reclamation and Safety Impacts, which would make up for any potential loss of soil needed as growth media.

At the Rossi Mine, all contaminated soils are removed from the spill site, placed in dedicated dumpsters, and transported off-site. Multiple solid waste dumpsters are located within the processing area during operations, and wastes are disposed of in accordance with the RCRA regulations for hazardous waste management.

Surface disturbance of existing soils under the Proposed Action would increase the potential for the establishment of noxious weeds and non-native invasive plant species as presented in Section 3.15, Noxious Weeds and Non-native Invasive Plant Species.

Reclamation and Safety Impacts

Reclamation involves restoring the post-closure mining area to pre-mining land uses. Pre-mining land uses at the project site are mineral exploration, livestock grazing, wildlife habitat, utility corridors, and dispersed recreation.

A primary factor in restoring the site to previous uses is revegetation success, which in turn largely depends on the quality of the growth media. As discussed above and in Section 2.3.11, Growth Media Stockpiles, topsoil would be salvaged during mining operations, stockpiled within the authorized disturbance area, and retained for use in reclamation. In operating years prior to 1981, growth media were salvaged on a limited basis; therefore, a deficit in growth media may exist with respect to the acreage to be covered during reclamation activities. The total amount of growth media available for reclamation is estimated to be approximately 24,000,000 cf of which an estimated 29,000,000 cf of growth media would be required for mine reclamation assuming a six inch cover depth (HES 2016d), as described in Section 2.3.12.4, Cover Material. HES would import growth media from offsite as needed to meet reclamation requirements. In conjunction with salvaged soils, HES proposes to use jig fines, weakly lithified conglomerate and mudstone of the Carlin Formation, and Carlin Tuff to supplement salvaged growth media. HES would first test these supplemental growth media materials with the proposed seed mixture to judge their success for use in reclamation to stabilize soils as discussed in Section 2.3.12.4, Cover Material. Revegetation success would be evaluated through an annual monitoring program until revegetation standards stipulated in the Nevada Guidelines for Successful Revegetation (NDEP 2015a) have been met.

Other factors requiring consideration are topography and potential presence of mining support facilities and contaminants at the site. Two open pits, if not backfilled or partially backfilled, and several WRDFs would remain. Open pits pose hazards to both humans and wildlife. Pit slopes in the open King Pit and

the Queen Lode Complex are expected to be approximately 40° to 45° (2.5H:1V to 2.2H:1V). The typical bench height is expected to be 60 feet. WRDFs are expected to be graded up to 2.5H:1V to 3:1 overall slope during reclamation.

As discussed in Section 2.3.12.6, Reclamation of Proposed Project Facilities, all mining support structures (buildings, power lines, water pipelines, processing facilities, mine roads, fences, gates, communication tower, etc.) would be removed from public lands and disturbance reclaimed. Buildings at the Rossi Mine include both temporary structures and buildings on concrete foundations. Mine closure would involve removal of temporary structures, permanent structures, and debris. However, concrete foundations would be buried in place under a minimum of five feet of material and six inches of growth media. Above-ground utilities (e.g., electrical infrastructure, pipes) would be removed, and underground utilities would be removed or capped as appropriate and abandoned. All contaminated soil would be removed from the site. Drill holes would be plugged and abandoned, and monitoring and production wells would be plugged and abandoned according to state regulations. Most roads would be ripped, as discussed above, although a few would remain as public roads to provide public access to areas north and west of the site. Open pits remaining at the end of mining would have a berm placed approximately 15 feet from the edge of the pit with either a signed warning of a hazard or fenced or both. Accordingly, the mine would be closed in such a way as to eliminate access to the open pits.

3.13.2.2 Reconfiguration Alternative

Under the Reconfiguration Alternative, facility designs, operations schedules, anticipated workforce and employment, and Applicant Committed Environmental Protection Measures would remain the same as the Proposed Action. Therefore impacts to soil resources would be the same with the following exception. Under the Reconfiguration Alternative, the footprint of the QLC WRDFs and the Dawn WRDF would be reduced in comparison to the Proposed Action, and the eastern portion of the QLC would be backfilled and reclaimed. Under the Reconfiguration Alternative, 151 fewer acres would be disturbed than under the Proposed Action. Qualitatively, soil, reclamation, and safety impacts would generally be the same as those under the Proposed Action.

3.13.2.3 Livestock Fencing Alternative

Under the Livestock Fencing Alternative, operations, facility designs, operations schedules, anticipated workforce and employment, and Applicant Committed Environmental Protection Measures would remain the same as the Proposed Action with the following exception. Under the Livestock Fencing Alternative an additional 7 acres of surface disturbance would result from fencing installation. These acres would be in addition to disturbance acreages reported for the Proposed Action and Reconfiguration Alternative. The fence would be removed once the mine is reclaimed and revegetation is determined successful by the BLM and NDEP.

3.13.2.4 No Action Alternative

Under the No Action Alternative, the proposed project would not be developed, and impacts associated with soil resources and reclamation would not occur. The King Pit expansion and QLC Pit expansion would not take place, the Dawn Pit would not be constructed, the Dawn WRDF would not be created, and associated facilities would not be constructed. Continuation of mining activities associated with the Rossi Mine, completion of closure and reclamation activities associated with the existing disturbance, and ongoing exploration activities would be conducted under existing authorizations.

Under the No Action Alternative, although there would be no new authorized disturbance, development of the previously authorized facilities would continue. Under the No Action Alternative, the types of impacts to soil resources, reclamation procedures, and safety impacts would generally be the same, yet reduced in scope in comparison to the Proposed Action.

3.13.3 Cumulative Impacts

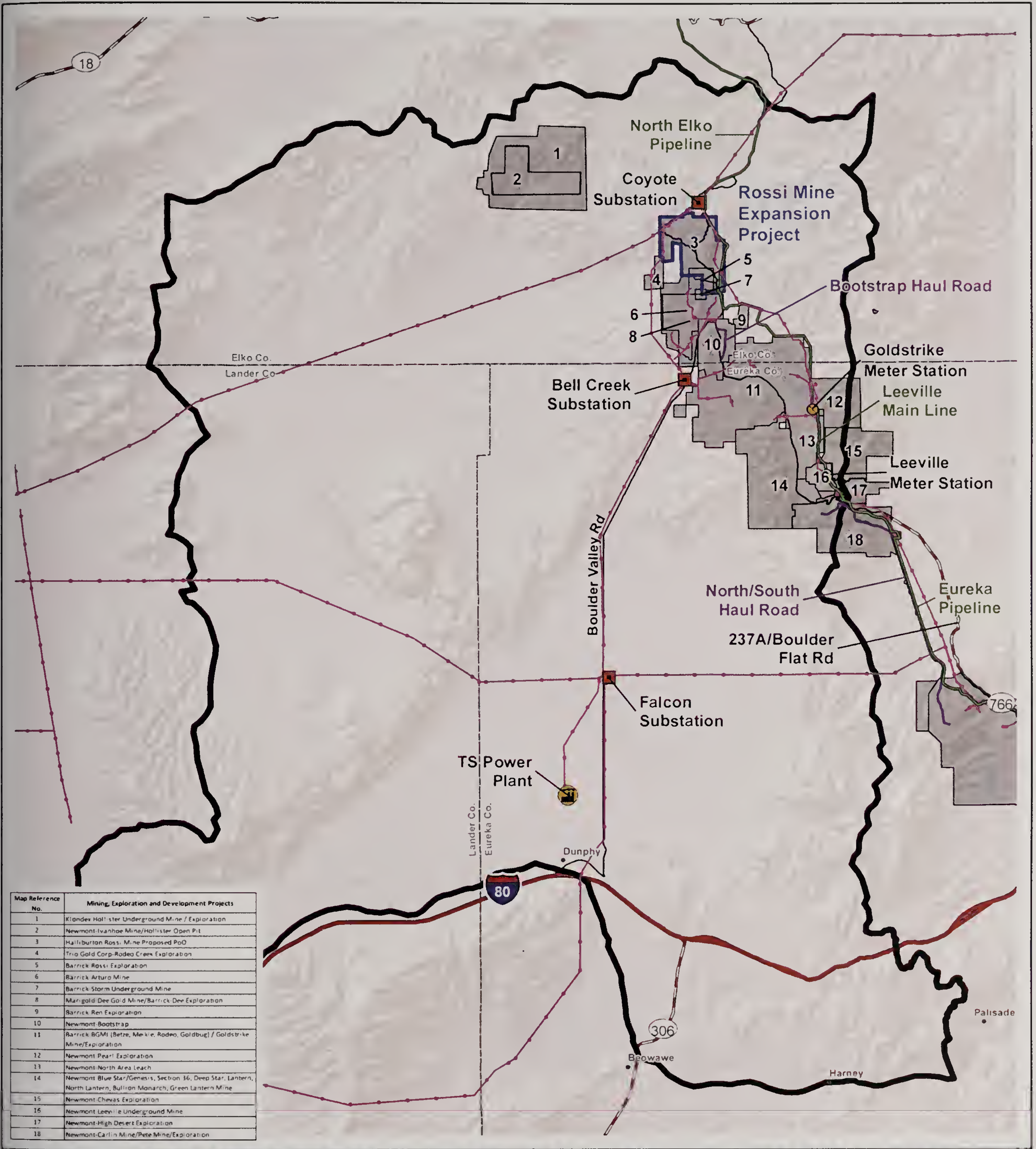
As stated in Section 3.13.1, the CESA for soil resources and reclamation is the Rock Creek Valley and Boulder Flat hydrographic basins, which encompasses 632,757 acres, as shown in **Figure 3.13-1**. Cumulative impacts to soils and reclamation result from surface disturbance related to mining and exploration, energy development, wildfire, grazing, dispersed recreation, roads, and other natural and human-caused activities within the CESA.

The impacts from past, present, and RFFAs are discussed in Section 3.2, Past, Present, and Reasonably Foreseeable Future Actions. RFFAs for mining and exploration activities are identified in **Table 3.2-1**; their locations are shown in **Figure 3.2-1** and **Figure 3.2-2**. **Figure 3.2-2** also illustrates some ROW actions. These projects include primarily mining and mineral exploration projects, but also include pipeline and electric utility projects, and other RFFAs as shown in **Figure 3.2-2**. Those projects that are within the Soils and Reclamation CESA are shown in **Figure 3.13-1** and would result in approximately 29,454 acres of disturbance within the CESA, or 4.6% of the CESA.

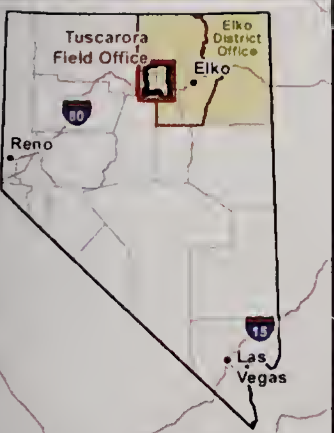
In addition to the mining and exploration activities identified in this section, numerous major wildfires have occurred in the soils and reclamation CESA, creating additional impacts on soils. Cumulative impacts on soils as a result of wildfire include physical, biological, and chemical changes, such as breakdown in soil structure, reduced moisture retention, loss of organic soil matter through combustion, changes in microbial and invertebrate species and population dynamics, and partial loss of root systems (USFS 2005).

Figure 3.13-4 shows the locations of past wildfires within the CESA. Wildfires have burned a total of 439,909 acres in the CESA, or 69.5% of the CESA, including within the study area, since 1980.

Further, the CESA holds several grazing allotments on public lands, totaling 294,763 acres on BLM lands and 127 acres on Bureau of Reclamation lands, for a total of 294,890 acres, or 46.6% of the CESA. An additional 189,578 acres of grazing land are held in private ownership. **Figure 3.13-5** shows the grazing allotments in the CESA. Grazing can result in increased soil compaction, removal of ground cover, and reduced infiltration. These can lead to increased runoff and erosion as well reduced soil quality.



Map Reference No.	Mining, Exploration and Development Projects
1	Klondex Hollister Underground Mine / Exploration
2	Newmont-Ivanhoe Mine/Hollister Open Pit
3	Halliburton Rossi Mine Proposed PoO
4	Trio Gold Corp-Rodeo Creek Exploration
5	Barrick Rossi Exploration
6	Barrick Arturo Mine
7	Barrick Storm Underground Mine
8	Marigold Dee Gold Mine/Barrick-Dee Exploration
9	Barrick Ren Exploration
10	Newmont-Bootstrap
11	Barrick BGMI (Betze, Meikle, Rodeo, Goldbug) / Goldstrike Mine/Exploration
12	Newmont Pearl Exploration
13	Newmont North Area Leach
14	Newmont Blue Star/Genesis, Section 36, Deep Star, Lantern, North Lantern, Bullion Monarch, Green Lantern Mine
15	Newmont-Chevas Exploration
16	Newmont Leeville Underground Mine
17	Newmont-High Desert Exploration
18	Newmont-Carlin Mine/Pete Mine/Exploration



Project Study Area

Soils and Reclamation Cumulative Effects Study Area

Existing and Reasonably Foreseeable Projects

- Metering Station
- Power Plant
- Substation
- Pipeline
- Road
- Transmission Line
- Mine Plan Boundaries

Source: NDWR 2015, BLM 2015g, SRK 2014a, BLM 2010b.

Rossi Mine Expansion Project EIS

Figure 3.13-3

Past, Present, and RFFAs within the Soils and Reclamation Cumulative Effects Study Area

0 1 2 3 4 5 Miles
0 1 2 3 4 5 Kilometers
1:380,000

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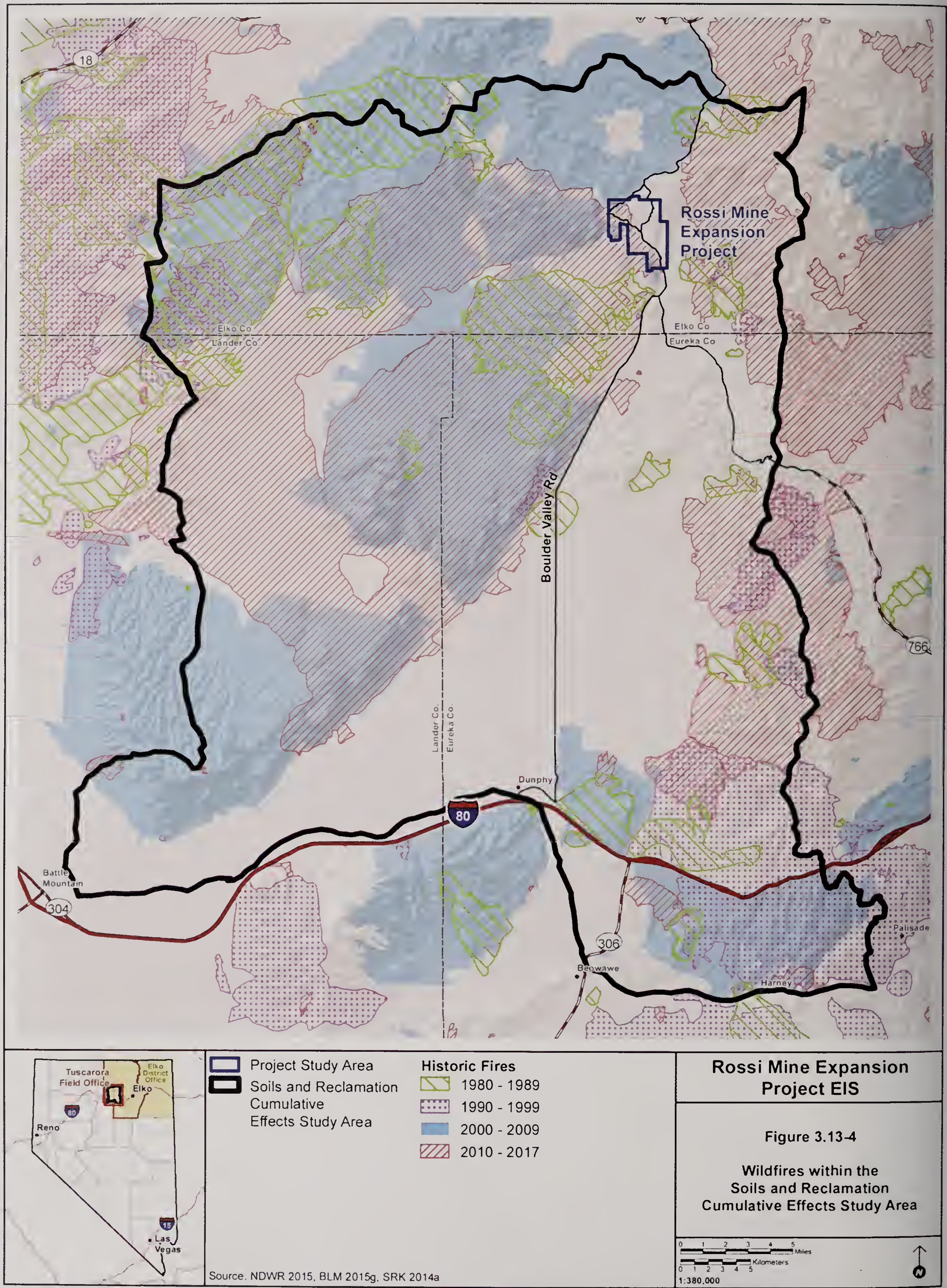

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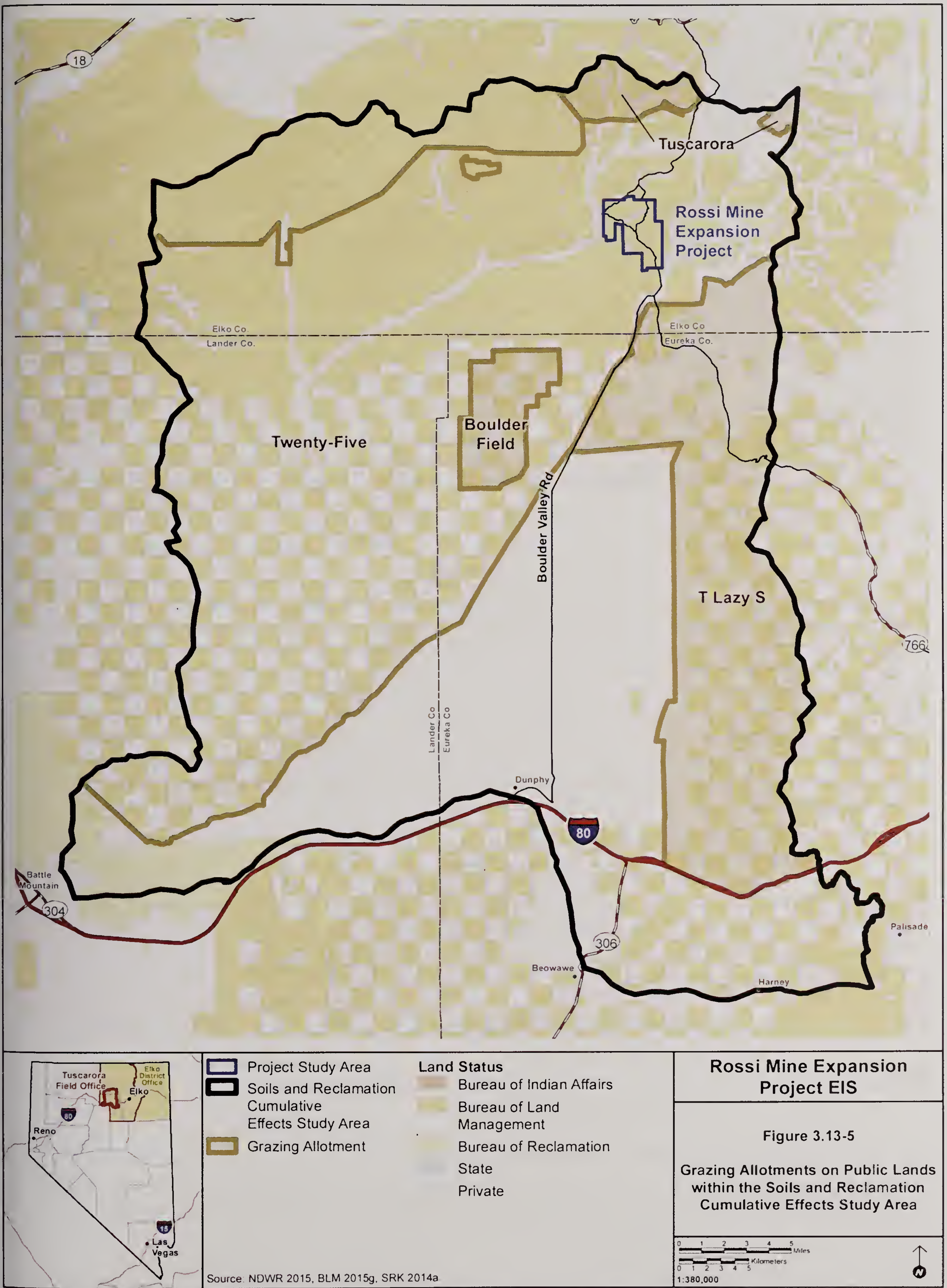

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Figure 3.13-5

Grazing Allotments on Public Lands within the Soils and Reclamation Cumulative Effects Study Area

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3.13.3.1 Proposed Action

Cumulative impacts on soil resources resulting from the Proposed Action include the following:

- Changes to the soil structure and biology and associated loss of soil quality, fertility, and potential as successful growing media
- Erosion and associated loss of growing media for reclamation purposes
- Sedimentation and associated loss of habitat and increased potential for flooding

The Proposed Action would involve excavation, storage, and reuse of soil as growth media. Reclaimed jig fines as well as inorganic topsoil created from weakly lithified conglomerate and mudstone of the Carlin Formation and Carlin Tuff harvested from the project site would supplement the excavated soil, as specified in the Reclamation Plan. Analysis of reclaimed jig fine samples, as presented in **Table 3.4-10**, indicated that average concentrations of arsenic and manganese slightly exceeded NDEP reference values as presented in Section 3.4.1.5, Rock Geochemistry. Further, Humidity Cell Tests of reclaimed jig fines as presented in Section 3.4.1.5, Rock Geochemistry, produced circum-neutral to mildly alkaline leachate and exhibited low associated metal release (SRK 2014e). Cumulative impacts on drainage would be mitigated by implementation of the Reclamation Plan. Surface configurations and drainage controls would manage and minimize runoff during project operation and after mine closure.

Cumulative impacts relating to reclamation as a result of the Proposed Action include the following:

- Revegetation success
- Changed topography
- Presence of mining artifacts, including contaminants

The Proposed Action includes a monitoring program to ensure revegetation success under the Reclamation Plan. Vegetation monitoring would be conducted annually for a minimum of three years in accordance with the Nevada Guidelines for Successful Revegetation (NDEP 2015a). Monitoring would continue until revegetation standards have been met as stipulated in the Reclamation Plan. The use of fertilizer and soil amendments is not included under the Proposed Action but may be recommended by the BLM depending upon the results of vegetation monitoring. The Proposed Action would change the topography in the project area, resulting in an unfilled pit and a partially filled pit with benched walls, graded WRDFs, and drainage controls throughout the site. Some mining artifacts or remnants would remain, such as buried utilities (e.g., pipelines, and open pits). All contaminated soil would be removed and managed in accordance with RCRA guidelines.

Past and present actions within the Soils and Reclamation CESA have resulted, or would result, in approximately 27,454 acres of surface disturbance from mining exploration, pipelines, and electric utility projects. RFFAs within the Soils and Reclamation CESA are anticipated to result in an additional 2,000 acres of surface disturbance, resulting from potential future expansion of current mining projects in the Carlin Trend area (Newmont Blue Star/Genesis, Section 36, Deep Star, Lantern, North Lantern, Bullion Monarch, Green Lantern, Carlin Mine), for a total cumulative disturbance acreage of 29,454. The Proposed Action would incrementally increase the disturbance within the CESA by 1,167 acres (4 percent), resulting in a total cumulative disturbance of 30,621 acres. Because monitoring would be implemented to ensure the success of revegetation and drainage stability, the disturbance would be temporary until reclamation is complete and successful. Topography would be permanently changed but would not result in unstable conditions that could lead to mass wasting (downslope movement of earth materials) or other soil instabilities. The cumulative soils impact would be minor, and the cumulative impact related to topographic changes would be moderate.

3.13.3.2 Reconfiguration Alternative

Under the Reconfiguration Alternative, cumulative soils impacts would be similar to, but less than, those under the Proposed Action. The disturbance would be 1,016 acres, 151 acres less than under the Proposed Action.

3.13.3.3 Livestock Fencing Alternative

Under the Livestock Fencing Alternative, cumulative soils impacts would be the same as under the Proposed Action and Reconfiguration Alternative with the addition of 7 acres of surface disturbance resulting from fence installation. Upon successful reclamation and revegetation as determined by BLM and NDEP, the fence would be removed.

3.13.3.4 No Action Alternative

Under the No Action Alternative, there would be no additional disturbance within the CESA. The Proposed Action would not contribute to a cumulative impact.

3.13.4 Potential Monitoring and Mitigation

No additional mitigation beyond that prescribed in the Reclamation Plan is recommended. The Reclamation Plan specifies monitoring for slope stability, stormwater, groundwater resources, reclamation, and noxious weeds. The Reclamation Plan specifies the following:

- Once disturbance is no longer anticipated in an area, reclamation would occur with subsequent monitoring of revegetation success. Vegetation monitoring would be conducted annually for a minimum of three years in accordance with the Nevada Guidelines for Successful Revegetation (NDEP 2015a). Monitoring would continue until revegetation standards have been met as stipulated in the Reclamation Plan.

3.13.5 Residual Impacts

Residual impacts to soils would include a permanent irreversible loss of soil productivity and quality on approximately 194 acres of open pits that may not be reclaimed under the Proposed Action. Under the Reconfiguration Alternative, residual impacts would include permanent irreversible loss of soil productivity and quality on approximately 144 acres of open pits that may not be reclaimed.

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3.14 Vegetation, including Riparian Zones and Wetland Areas

3.14.1 Affected Environment

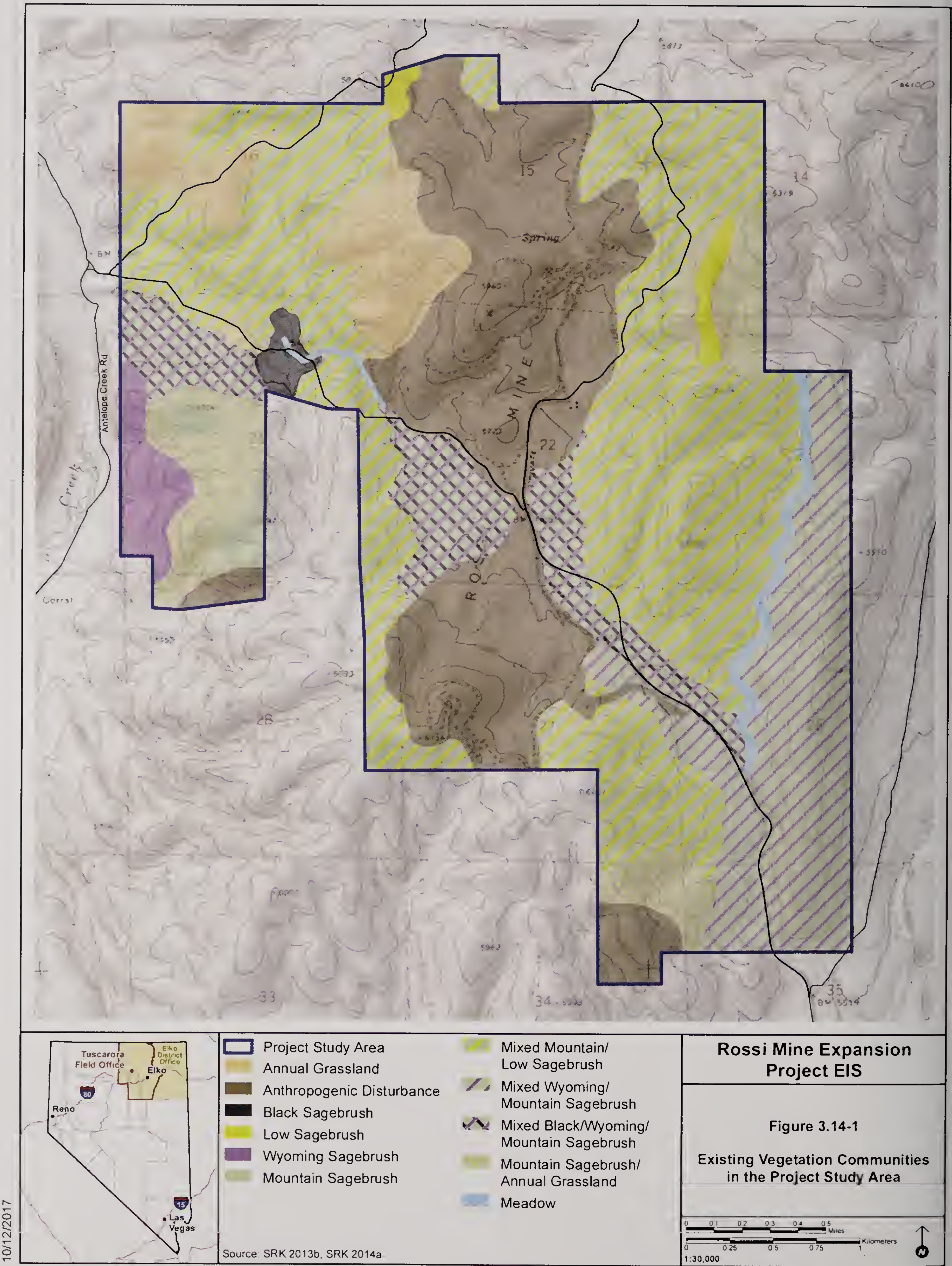
The study area for vegetation resources includes the area within the proposed PoO boundary (**Figure 3.14-1**). The CESA for vegetation resources covers the Twenty-Five Allotment as well as the Boulder Field, T Lazy S, and Mary's Mountain grazing allotments and Boulder Creek Valley area between the T Lazy S and Twenty-Five Allotment (**Figure 3.14-2**). The study area for riparian zones and wetland areas is the same as vegetation resources. The CESA for riparian zones and wetland areas encompasses the Rock Creek, Boulder Valley, and Maggie Creek Area hydrographic basins along the Carlin Trend. These three basins drain southward into the Humboldt River.

3.14.1.1 General Vegetation

The vegetation study area is located in the Upper Humboldt Plains subdivision of the Central Basin and Range ecoregion. The Central Basin and Range ecoregion is the predominant ecoregion in Nevada and is composed of elevated internally drained xeric basins in between scattered mountain ranges (Bryce et al. 2003). Xeric basins are characterized as having low annual precipitation amounts and are generally very dry. The vegetation is a mosaic of sagebrush or saltbush-greasewood shrublands and salt flats. The climate is arid, with annual precipitation typically 10 to 12 inches (NRCS 2015b). The elevation ranges from 5,400 to 6,300 feet above mean sea level (SRK 2013b). The Upper Humboldt Plains subdivision consists of rolling plains with occasional buttes and low mountains (Bryce et al. 2003). Due to its elevation range, this subdivision is cooler and wetter than the Central Basin and Range subdivisions, resulting in increased dominance of cool-season grasses in areas of shallow, stony soil (Bryce et al. 2003). Substrates consist of volcanic ash, rhyolite, and tuffaceous rocks.

Distribution of vegetation types in the study area is strongly influenced by variations in landscape position, soil type, moisture, elevation, and aspect. Plant species composition, abundance and vegetative structure have been affected by previous disturbances within the project area including wildfires, livestock grazing, mine operations, exploration activities, and reclamation. Vegetation cover and land use types, and plant community characterizations were compiled based on NRCS ecological site descriptions, existing NEPA documents and site-specific wetland and vegetation studies conducted within the study area (BLM 2014a, SRK 2013b, NRCS 2015c, NRCS 2015b). Species nomenclature herein is consistent with the USDA-NRCS Plants Database (NRCS 2015b).

An ecological site is a landform with specific physical characteristics, which differs from other landforms in its ability to produce distinctive kinds and amounts of vegetation and in its response to management. General vegetation types comprise multiple ecological sites. Seven ecological sites are located in the study area (**Table 3.14-1**). **Table 3.14-1** summarizes ecological sites in the study area and the characteristic dominant vegetation for each ecological site. Characteristic vegetation may not be present in these ecological sites due to prior disturbance from human activities and wildfires.



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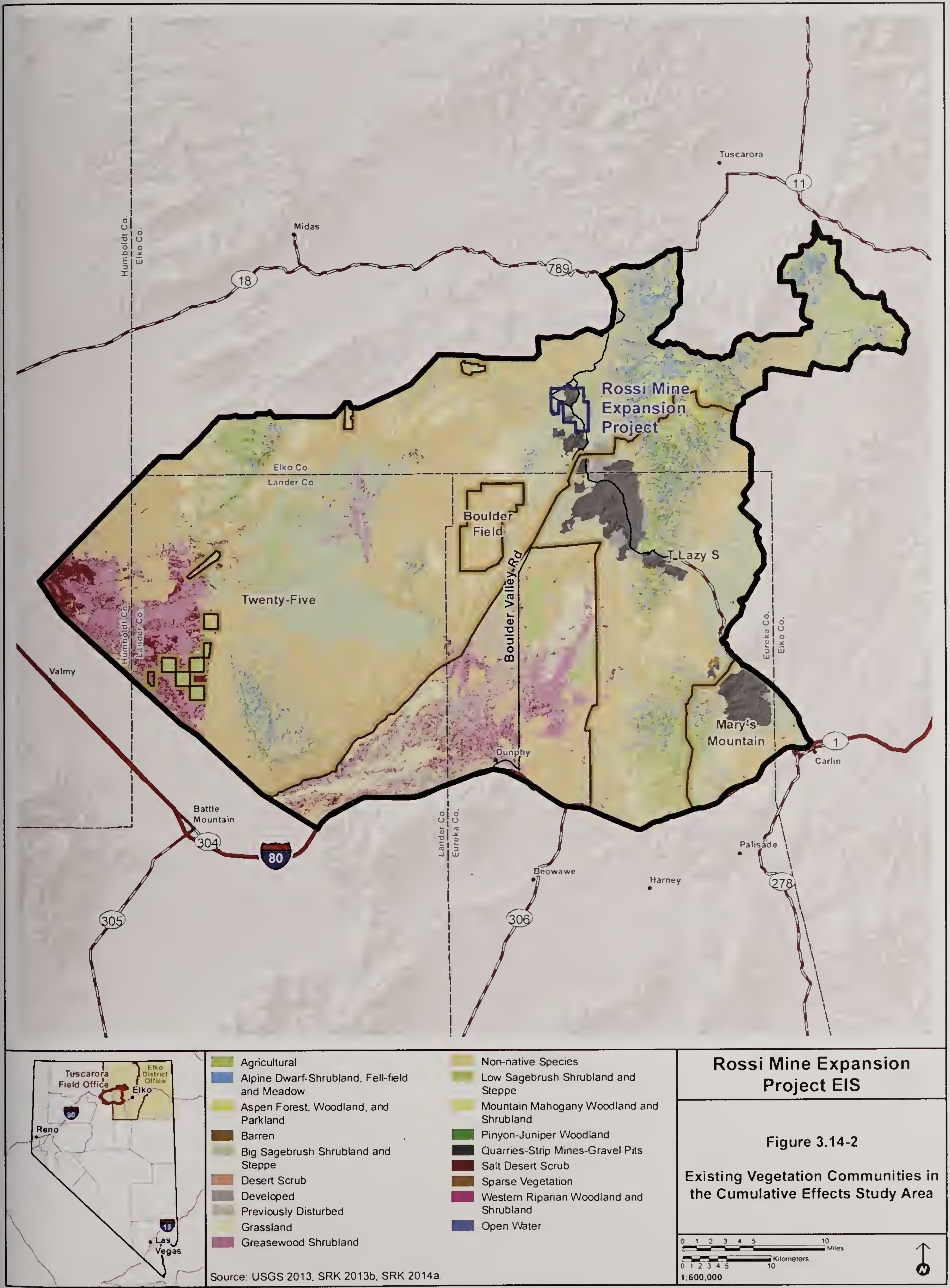

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Figure 3.14-2

Existing Vegetation Communities in the Cumulative Effects Study Area

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Table 3.14-1. Ecological Sites within the Study Area

Dominant Vegetation Type	Ecological Site Code	Ecological Site Name	Acres	Percent of Study Area
Grassland	025XY003NV	LOAMY BOTTOM 8-14 P.Z.	101	3
	025XY005NV	WET MEADOW	63	2
	025XY006NV	DRY MEADOW	3	<1
Low Sagebrush	025XY017NV	CLAYPAN 12-16 P.Z.	1,392	37
	025XY018NV	CLAYPAN 10-12 P.Z.	798	21
Big Sagebrush	025XY014NV	LOAMY 10-12 P.Z.	1,101	29
Wyoming Big Sagebrush	025XY019NV	LOAMY 8-10 P.Z.	161	4
Undefined[1]			112	3

Sources: NRCS 2015b; NRCS 2015c.

[1] Some areas of the study area have not been defined by Ecological Site Descriptions.

The dominant cover type within the study area, sagebrush shrubland, is composed of a dominant overstory of shrubs and a subdominant understory of herbaceous species (**Table 3.14-2**). This vegetation type comprises 61 percent of the study area and consists of three specific vegetation types (low sagebrush, mountain big sagebrush, and Wyoming big sagebrush). Usually found on dry flats and plains, alluvial fans, rolling hills, rocky hill slopes, saddles and ridges, the substrate for this vegetation type is typically deep, well-drained and non-saline soils. Exposure to desiccating winds is common for these areas. This cover type is found on both burned and unburned areas in the study area. The dominant shrub, depending on location, is mountain big sagebrush (*Artemisia tridentata* spp. *vaseyana;* the most prevalent sagebrush in the study area), low sagebrush (*Artemisia arbuscula*), or Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*). Occasional associated shrubs include twistleaf rabbitbrush (*Chrysothamnus viscidiflorus var. viscidiflorus*), smooth horsebrush (*Tetradymia glabrata*), prickly phlox (*Leptodactylon pungens*) and serviceberry (*Amelanchier alnifolia*) appearing sporadically in small groups. Understory species consist of grasses and forbs including bluebunch wheatgrass (*Pseudoroegneria spicata*), Sandberg bluegrass (*Poa secunda*), cheatgrass (*Bromus tectorum*), and bottlebrush squirreltail (*Elymus elymoides*). Soils associated with this vegetation cover type are typically deep, well-drained, and non-saline. **Figure 3.14-1** illustrates the vegetation cover and existing anthropogenic disturbance within the study area based on baseline vegetation surveys (SRK 2013b). **Figure 3.14-2** illustrates the vegetation communities in the CESA.

Table 3.14-2. Land Cover Types within the Study Area

Land Cover	Area (acres)	Percent of Study Area (%)
Mixed Mountain and Low Sagebrush	1,345	36
Anthropogenic Disturbance	932	25
Mixed Wyoming Big and Mountain Sagebrush	475	13
Mixed Black, Wyoming Big and Mountain Big Sagebrush	290	8
Mountain Sagebrush/Annual Grassland	242	6
Annual Grassland	224	6
Wyoming Sagebrush	70	2
Meadow	46	1
Mountain Sagebrush	41	1
Low Sagebrush	32	<1
Black Sagebrush	25	<1
Open Water, Riparian Zones, and Herbaceous Wetlands	10	<1

Source: SRK 2013b.

Previously burned areas occur throughout the study area and CESA (**Figure 3.14-3**). Approximately 1,732 acres in the study area have burned since 2000, of which 1,668 acres burned in the 2017 Rooster Comb fire (BLM 2017b). Fire has provided the basis for a predominantly annual grass understory present throughout much of the study area. Also present are seeded grasses including crested wheatgrass (*Agropyron cristatum*), squirreltail grass (*Elymus elymoides*), thickspike wheatgrass (*Elymus lanceolatus* ssp. *lanceolatus*), slender wheatgrass (*Elymus trachycaulus* ssp. *trachycaulus*), and bluebunch wheatgrass (*Pseudoroegneria spicata*). Common weedy annual species include cheatgrass (*Bromus tectorum)*, prickly lettuce (*Lactuca serriola*), fiddlenecks (*Amsinckia menziesii* var. *menziesii* and *a. tessallata*), tumble mustard (*Sisybrium altissimum*), tall annual willowherb (*Epilobium brachycarpum*), and filaree (*Erodium* spp). Burned areas have been reseeded as part of fire rehabilitation seeding projects.

Historically, the BLM has implemented vegetation treatments within the Rossi Mine vicinity in response to wildfires. In 1965, aerial seeding of various native species and drill seeding of crested wheatgrass was conducted by the BLM in areas burned by the 1964 Boulder Fire located within the current PoO boundary and to the immediate south of the Rossi Mine (BLM 1965a, b).

Existing disturbance occupies 25 percent of the study area and is characterized by surface disturbance from previous and existing mine operations.

Riparian zones/herbaceous wetland areas and water features occupy <1 percent of the study area and are composed of stream channels, riparian/wetland vegetation, and open water. Section 3.14.1.2, Riparian Zones and Wetland Areas, provides specific information regarding riparian zones and wetland areas.

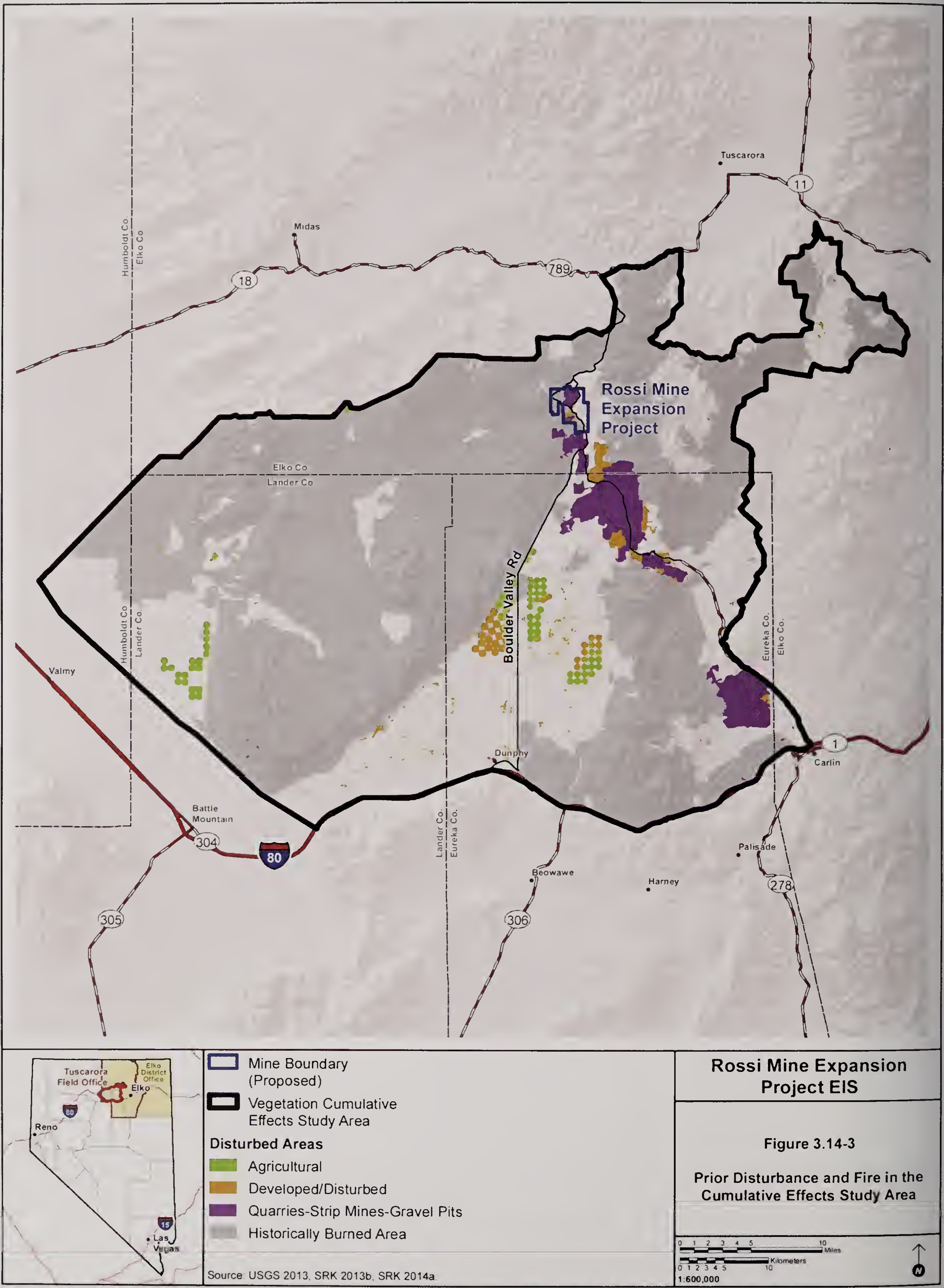

Figure 3.14-3

Prior Disturbance and Fire in the Cumulative Effects Study Area

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data.
Original data were compiled from various sources. This information may not meet National Map Accuracy Standards.
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11/10/2017

3.14.1.2 Riparian Zones and Wetland Areas

Riparian and wetland features in the study area include riparian zones, a perennial pond, and a seasonal pond. **Figure 3.14-4** illustrates riparian zones and wetland areas that occur in the study area.

The term wetland is defined in 33 CFR 328, 7(b) as it applies to the jurisdictional limits of the USACE under the Clean Water Act as "those areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas." Note that the frequency and duration of saturation may vary by geographical region and is largely dependent upon local climatic conditions. Wetlands adjacent to other waters of the United States, such as streams, also are considered to be waters of the United States.

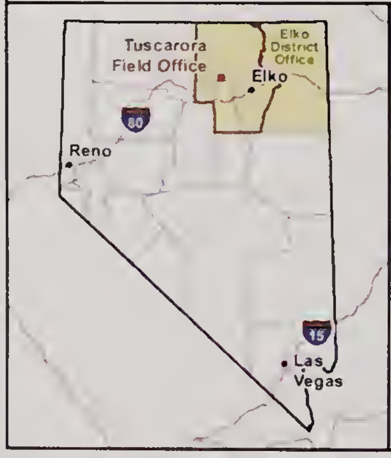
According to the USACE's 1987 Wetland Delineation Manual, a three-parameter approach is required for delineating USACE-defined wetlands (Environmental Laboratory 1987). Based on this approach, areas are identified as wetlands if they exhibit the following characteristics:

1. The prevalence of vegetation consisting of hydrophytic species or plants that have the ability to grow in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content and depleted soil oxygen levels.
2. The presence of soils that are classified as hydric or possessing characteristics that are associated with reducing soil conditions. Hydric soils are poorly drained and have a seasonal high water table within 6 inches of the surface.
3. An area that is inundated either permanently or periodically at mean water depths less than or equal to 6.6 feet or the soil is saturated to the surface at some time during the growing season of the prevalent vegetation.

The USACE (Environmental Laboratory 1987) requires that, under normal circumstances, all three of these conditions be met for an area to be considered a wetland under the USACE's definition.

Additional guidance on wetlands is provided in the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0) (USACE 2008). For the purposes of NEPA, the analysis in this EIS must address all wetlands, even if they are not jurisdictional under the Clean Water Act, because even non jurisdictional wetlands are part of the human environment.

Riparian and wetland areas were identified within the study area based on publically available data and field surveys of all potential wetland and riparian features and surveys to delineate jurisdictional wetlands. In 2012, using ongoing seep and spring monitoring studies by SRK Consulting (U.S.), Inc. (SRK), as a basis, EcoSynthesis Scientific and Regulatory Services, Inc. (EcoSynthesis) visited and investigated for riparian characteristics each cattle pond, spring, pond, or damp area that SRK had previously located within the study area, as well as distinctive patches of hillside vegetation (EcoSynthesis 2013). Only two natural (spring-supported) riparian features (W-1 and W-7) were found (**Figure 3.14-4**). Other areas of riparian vegetation were found adjacent to ponds or along a roadside drainage channel. Ponds (whether perennial or seasonal) were categorized as non-riparian. Field investigations to identify jurisdictional wetlands and waters of the U.S. were also conducted in the study area in 2012 and 2014. These investigations identified eight wetland features (some of which overlap with riparian zones identified in prior surveys) in the project area. The eight wetland areas within the study area are shown in **Table 3.14-3** and illustrated in **Figure 3.14-4**.



Project Study Area
Seep or Spring
Perennial Stream Reach
Discontinuous Stream Reach
Intermittent/Ephemeral Stream Reach
Wetland
Riparian Zone

Source: AECOM 2014, EcoSynthesis 2013, BLM 2000b, SRK 2014a

Rossi Mine Expansion Project EIS

Figure 3.14-4

Seeps, Riparian Zones and Wetlands within the Project Study Area

0 0.1 0.2 0.3 0.4 0.5 Miles
0 0.25 0.5 0.75 1 Kilometers
1:30,000

2/20/2018

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Table 3.14-3. Wetland Areas within the Study Area

Wetland ID	Wetland Vegetation	Acres	Jurisdictional[1]
W-1	Baltic rush, waterclover, curly dock, salt grass, bulrush.	1.11	No
W-2	Willows, canary reed grass, and cattails (jig pond).	5.65	No
W-3	Willows (overflow pond for jig pond).	2.5	No
W-4	Heavily grazed, bare ground 85 percent of cover. Fowl bluegrass, and cheat grass.	0.03	No
W-5	Heavily grazed. Sedges.	0.02	No
W-6	Heavily grazed. Sedges, Baltic rush, salt grass, willows, and curly dock.	0.05	No
W-7	Heavily grazed. Salt grass, meadow barley, and Baltic rush.	0.17	No
W-8	Signs of grazing. Salt grass, meadow barley, curly dock, and grass sp.	0.42	No
Total Acres		**9.95**	

Source: AECOM 2014.

[1] Identified as a wetland as defined by the USACE and subject to jurisdiction the Clean Water Act.

Typical species found in the wetlands along the ephemeral channels and more heavily vegetated portions of these wetlands include willows (*Salix spp.*) cattails (*Typha* spp.), meadow barley (*Hordeum brachyantherum*), and Baltic rush (*Juncus balticus*) (AECOM 2014). Species that typically occur where vegetation is more heavily grazed include cheatgrass, fowl bluegrass (*Poa palustris*), and curly dock (*Rumex crispus*) (AECOM 2014). Of the eight wetlands identified in the study area, two are located along tributaries to Boulder Creek, one is located along a tributary to Little Coyote Creek, three are associated with human-constructed ponds, and two are associated with seeps (AECOM 2014). Only three wetlands are larger than 1 acre, with the largest mapped wetland being approximately 5.65 acres. Seeps that occur within the study area are associated with either historic sedimentation or runoff control features or occur at the base of waste rock facilities or other drainage features that have developed in relation to mine activities.

No wetland features in the study area are subject to jurisdiction by the USACE because they lack a significant nexus with a traditional navigable water. Flow in Boulder Creek is seasonal on its northern end where the flow rate is dictated by rain events. Further downstream Boulder Creek becomes ephemeral and loses flow from evapotranspiration and agricultural ditch diversions (BLM 2014a). Therefore, Boulder Creek does not have any hydrologic connection with the Humboldt River and any upstream features that flow to Boulder Creek are isolated and lack a significant nexus with a traditional navigable water. Hydrologic features in the CESA are shown on **Figure 3.14-5**.

Project Study Area

Water Resources Cumulative Effects Study Area

Hydrographic Basin

Riparian Zone and Associated Wetland

Source: EcoSynthesis 2013, BLM 2000b, NDWR 2015, SRK 2014a.

Rossi Mine Expansion Project EIS

Figure 3.14-5

Riparian Zones and Associated Wetlands within the Cumulative Effects Study Area

0 1 2 3 4 5 10 Miles

0 1 2 3 4 5 10 Kilometers

1:500,000

10/12/2017

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3.14.2 Environmental Consequences

Primary issues related to vegetation resources include loss or degradation of upland and riparian/wetland vegetation communities and revegetation measures used for reclamation activities. The potential impacts of the proposed project on vegetation can be classified as short-term (temporary) and long-term duration. Short-term impacts result from surface disturbances related to construction, operation and interim and final reclamation activities that would occur over the 8-year mine life and 5-year reclamation period. Short-term impacts would cease upon mine closure and completion of successful reclamation. Long-term impacts consist of permanent changes to vegetation communities, irrespective of reclamation success. Short-term and long-term impacts are discussed in more detail below.

3.14.2.1 Proposed Action

General Vegetation

Under the proposed project, mine development and operation would disturb a total of approximately 2,063 acres, of which 1,167 acres would result from newly authorized surface disturbance. Approximately 206 acres would occur in areas of existing disturbance, and 961 acres would occur in previously undisturbed areas. The majority of the disturbance would occur in the sagebrush shrubland type, upland areas, and/or areas previously disturbed by historical mining activities.

Table 3.14-4 lists the ecological sites that would be disturbed from project construction and operation. Acres of ecological sites impacted by mining activities were estimated by intersecting the area impacted by mining activities with the ecological sites within the study area boundary.

Table 3.14-4. Proposed Action – Disturbed Acres of Ecological Sites within the Study Area

Dominant Vegetation Type	Ecological Site Code	Ecological Site Name	New Disturbance	Total Disturbance	Total Disturbance Percent of Study Area (%)[2]
Grassland	025X6003NV	LOAMY BOTTOM 8-14 P.Z.	35	61	2
	025XY005NV	WET MEADOW	23	41	1
	025XY006NV	DRY MEADOW	0	0	0
Low Sagebrush	025XY017NV	CLAYPAN 12-16 P.Z.	467	820	21
	025XY018NV	CLAYPAN 10-12 P.Z.	291	511	14
Big Sagebrush	025XY014NV	LOAMY 10-12 P.Z.	314	559	15
Wyoming Big Sagebrush	025XY019NV	LOAMY 8-10 P.Z.	0	6	0
Undefined[1]			37	65	2
Total			1,167	2,063	55

Sources: NRCS 2015b; NRCS 2015c.

[1] Some areas of the study area have not been defined by Ecological Site Descriptions.
[2] Total may vary due to rounding.

In addition, vegetation along existing access roads would be affected (e.g., reduction in growth rate) as a result of additional dust deposition.

Project-related activities would result in the loss of 1,072 acres of ecological sites with existing shrub-dominated vegetation or areas that could support shrub-dominated vegetation. With reclamation,

shrub-dominated vegetation cover type would return as grass/forb dominated vegetation cover type in the short term. Over the long term, shrubs would become re-established and increase in abundance within the majority of disturbed areas as a result of reclamation and natural re-colonization. The loss of shrub-dominated vegetation would represent a long-term impact as it could take up to 25 years following reclamation for mature shrub species to re-establish.

Under the Proposed Action, exploration would continue throughout the project area as described in Section 2.3.10, Exploration. Direct impacts to general vegetation from exploration would include short-term loss of approximately 67 acres. Locations of future exploration activity depend upon the results of drilling activity; therefore, specific vegetation types that would be impacted cannot be identified. Indirect impacts resulting from exploration activities would include short-term increases of fugitive dust, vibration, and localized soil compaction during road and pad construction and active drilling operations. Exploration would also result in an increase of fragmentation of the existing vegetation communities within the project area.

Table 3.14-5 lists the land cover types that would be disturbed from project construction, operation, and exploration. Acres of land cover types impacted by mining activities were estimated by intersecting the area impacted by mining activities with the land cover types within the study area boundary.

Table 3.14-5. Proposed Action – Disturbed Acres of Land Cover and Vegetation Types within the Study Area

Vegetation Type	New Disturbance	Total Disturbance[1]	Total Disturbance Percent of Study Area (%)
Annual Grassland	46	131	4
Anthropogenic Disturbance	206	916	24
Black Sagebrush	1	1	0
Low Sagebrush	2	8	0
Meadow	2	5	0
Mixed Black, Wyoming Big and Mountain Big Sagebrush	204	206	6
Mixed Mountain Big and Low Sagebrush	564	654	17
Mixed Wyoming Big and Mountain Big Sagebrush	98	98	3
Mountain Sagebrush	0	0	0
Mountain Sagebrush/Annual Grassland	44	44	1
Wyoming Sagebrush	0	0	0
Total	**1,167**	**2,063**	**55**

Source: SRK 2013b.

[1] Total disturbance includes previously authorized and proposed new surface disturbance.

Once further disturbance within a certain area is no longer anticipated, disturbed areas would be reclaimed and monitored for revegetation success in accordance with BLM and NDEP-BMRR regulations and as discussed in Section 2.3.12, Closure and Reclamation Plan. The goals of reclamation is for post-mining land uses to be consistent with pre-mining land uses, which include mineral exploration, livestock grazing, wildlife habitat, utility corridors, and dispersed recreation.

Reclamation activities would include, but would not be limited to:

- Implementing concurrent reclamation of facilities as soon as practicable during production;
- Controlling surface water runoff to limit erosion and sediment transport;
- Incorporating operational stormwater management facilities into the closure design;
- Placing growth media on disturbed areas, and seeding with the approved certified weed-free seed mixture; and
- Limiting and/or eliminating long-term maintenance (SRK 2014a).

Interim seed mixes would be used for concurrent reclamation during project operations. The interim seed mix uses three species that stabilize areas quickly, while the reclamation seed mix consists of a variety of native grasses, forbs, and shrubs to revegetate disturbed areas. Discussion of the final reclamation mix to be used for revegetation activities post-operations is provided in Section 2.3.12.5, Soil Preparation, Seeding and Planting, and Revegetation. The final reclamation seed mix would include plant species that best represent vegetation community assemblages found in transitional habitat that currently exists within the project area that have not been disturbed by previous mining or other development activity. Satisfactory revegetation of mine-related disturbance areas (i.e., assuming the primary goal of soil stabilization through presence of adequate plant cover) is anticipated to occur approximately 3 to 15 years following reclamation. After 25 years, the reclaimed plant communities likely would consist of adequate herbaceous plant cover with sufficient diversity to substantially reduce the potential for soil erosion and provide suitable forage for livestock and wildlife.

Interim reclamation would occur during mining operations, with final reclamation occurring thereafter for about 2 years and vegetation monitoring occurring for at least 3 additional years, in accordance with the *Nevada Guidelines for Successful Revegetation for Nevada Department of Environmental Protection, Bureau of Land Management, and the USDA Forest Service* (NDEP 2015a). Quantitative reclamation monitoring to measure compliance would begin after the third growing season and would continue annually until the reclamation success criteria are achieved. HES would submit an annual reclamation report, containing descriptions of the reclamation activities completed during the previous year, on or before April 15th of each year to the BLM and NDEP-BMRR for the preceding calendar year. Reclamation monitoring and maintenance activities would occur until the final reclamation bond is released.

Riparian Zones and Wetland Areas

The potential impacts of the proposed project on riparian zones and wetland areas would predominantly be considered long-term. Long-term impacts consist of permanent changes to wetland areas and riparian zones irrespective of post-closure and reclamation success. Impacts to wetland areas would result from surface disturbances, changes in surface water and groundwater flows, and the removal of water sources related to construction, operation, and reclamation activities. The King North WRDF, based on its mapped extent, would result in less than 0.1 acre of disturbance to one wetland area (W-1) (**Figure 3.14-4**). The Proposed Action would also disturb an additional 0.8 acres of riparian vegetation in the study area (W-7), which would result in complete disturbance of riparian vegetation in the study area, because the remaining 1.6 acres is located within areas of existing/authorized disturbance.

Exploration would not be conducted in riparian zones and wetland areas; therefore, impacts would be limited to potential increases in fugitive dust from exploration in adjacent upland areas and minor increases in sedimentation resulting from road and pad construction.

Indirect impacts to wetland areas as a result of soil erosion and sedimentation would be minimized with the implementation of erosion control measures as described in Section 2.3.13, Applicant Committed Environmental Protection Measures.

Upgrades to the existing Rossi Mine water system were previously authorized under NDEP Water Pollution Control Permit NEV #2015112 but have yet to be installed, as discussed in Section 2.2.7.9, Water Supply, Demand, and Management. The water conservation upgrades would eliminate the need for the existing lower stock pond identified as wetland area W-3 in **Figure 3.14-4**. Once the water conservation upgrades are installed and operating, water flow to wetland area W-3 would cease. This lack of consistent surface water flow would result in the existing 2.5 acres of W-3 area riparian and

wetland vegetation, consisting mainly of willows (AECOM 2014), to dry up because wetland vegetation requires consistent soil moisture and saturation to exist in an otherwise dry environment. The 2.5 acres comprising W-3 would be reclaimed, as discussed in Section 2.3.12.6, Reclamation of Proposed Facilities.

3.14.2.2 Reconfiguration Alternative

General Vegetation

The effects of the Reconfiguration Alternative to vegetation would be similar to the Proposed Action, except that sequencing of the construction and reclamation of the Dawn Pit would be conducted to reduce the duration of surface disturbance at this location. Additionally, construction of the QLC Pit and associated WRDFs would be modified from the Proposed Action, including complete backfilling of the eastern portion of the QLC Pit. Overall, this alternative would result in approximately 151 fewer acres of disturbance with proportionally less impact to vegetation resources in the study area.

Table 3.14-6 lists the ecological sites that would be disturbed from construction and operation under the Reconfiguration Alternative and **Table 3.14-7** shows the amount of disturbance by land cover type in the study area under this alternative.

Table 3.14-6. Reconfiguration Alternative – Disturbed Acres of Ecological Sites within the Study Area

Dominant Vegetation Type	Ecological Site Code	Ecological Site Name	New Disturbance	Total Disturbance	Percent of Study Area (%)[2]
Grassland	025X6003NV	LOAMY BOTTOM 8-14 P.Z.	30	57	2
	025XY005NV	WET MEADOW	20	38	1
	025XY006NV	DRY MEADOW	0	0	0
Low Sagebrush	025XY017NV	CLAYPAN 12-16 P.Z.	406	759	20
	025XY018NV	CLAYPAN 10-12 P.Z.	253	473	13
Big Sagebrush	025XY014NV	LOAMY 10-12 P.Z.	274	519	14
Wyoming Big Sagebrush	025XY019NV	LOAMY 8-10 P.Z.	0	6	0
Undefined[1]			33	60	2
			1,016	1,912	51

Sources: NRCS 2015b; NRCS 2015c.

[1] Some areas of the study area have not been defined by Ecological Site Descriptions.
[2] Total may vary due to rounding.

Table 3.14-7. Reconfiguration Alternative – Disturbed Acres of Vegetation Types within the Study Area

Vegetation Type	New Disturbance	Total Disturbance	Total Disturbance Percent of Study Area (%)
Annual Grassland	46	131	4
Anthropogenic Disturbance	209	918	24
Black Sagebrush	2	2	0
Low Sagebrush	2	8	0
Meadow	2	5	0
Mixed Black, Wyoming Big and Mountain Big Sagebrush	133	135	4
Mixed Mountain Big and Low Sagebrush	550	640	17
Mixed Wyoming Big and Mountain Big Sagebrush	59	60	2
Mountain Sagebrush	0	0	0
Mountain Sagebrush/Annual Grassland	13	13	0
Wyoming Sagebrush	0	0	0
Total	**1,016**	**1,912**	**51**

Source: SRK 2013b.

Riparian Zones and Wetland Areas

Under the Reconfiguration Alternative, the types of impacts to riparian zones and wetland areas would be the same as the Proposed Action, except that this alternative would result in 0.1 fewer acres of disturbance to riparian zones.

3.14.2.3 Livestock Fencing Alternative

Under the Livestock Fencing Alternative, in addition to the mining activities proposed under the Proposed Action or the Reconfiguration Alternative, a fence would be installed around the perimeter of the mine facilities to exclude livestock from 2,967 acres. Approximately 7 acres of surface disturbance would result from fence construction, with temporary adverse impacts to vegetation in the immediate vicinity of the fence. Over the long-term in upland areas, excluding livestock from the area could potentially alter vegetation species composition and structure through reduced grazing of existing grass and forb species within the fenced area; but these effects, should they occur, would be very minor and dispersed. Impacts from exploration activity under the Livestock Fencing Alternative would be the same as under the Proposed Action. The greatest impact of excluding livestock from the mine facilities would occur to existing wetland vegetation. As shown in **Table 3.14-3**, wetlands W-4, W-5, W-6, and W-7 were documented to be heavily grazed during surveys in 2014. Excluding livestock from these areas would result in an increase in vegetative cover in the short-term. Over the long-term and without other disturbance, vegetation structure may change with taller vegetation (e.g., willows, cattails) replacing grasses and sedges. The fence would be removed once the mine is reclaimed and revegetation is determined successful by the BLM and NDEP.

3.14.2.4 No Action Alternative

Under the No Action Alternative, the proposed project would not be developed and the related potential impacts to vegetation resources would not occur. Continuation of mining activities associated with the Rossi Mine, completion of closure and reclamation activities associated with existing disturbance, ongoing mineral exploration activities, and reclamation within the study area, would be conducted under existing

authorizations. No additional ground-disturbing activities beyond those currently authorized would occur at the mine site.

3.14.3 Cumulative Impacts

The CESA for vegetation resources and riparian zones and wetland areas is defined in Section 3.14.1, Affected Environment, and is shown in **Figure 3.14-2, Figure 3.14-3**, and **Figure 3.14-5** respectively. Past, present, and RFFAs are discussed in Section 3.2, Past, Present, and Reasonably Foreseeable Future Actions. RFFAs for mining and exploration activities are identified in **Table 3.2-1** and their locations are shown in **Figures 3.2-1** and **3.2-2**. **Figure 3.2-2** also illustrates some ROW actions.

3.14.3.1 Proposed Action

General Vegetation

Predominant native vegetation communities that occur in the CESA include big sagebrush shrubland and steppe, grassland, greasewood shrubland, salt desert scrub, low sagebrush shrubland and steppe, and pinyon-juniper woodland. Past, present, and RFFAs in the vegetation CESA have resulted, or would result, in approximately 40,286 acres of mine- and mineral exploration-related disturbance for locatable and salable minerals and includes 395 acres attributed to sand and gravel mining operations. Past, present, and RFFAs from utility and energy development including the North Elko Pipeline and TS Power Plant have resulted, or would result, in up to 379 acres of additional disturbance. The Proposed Action including exploration within the project area would incrementally increase disturbance by an additional 1,167 acres for a total cumulative disturbance of 41,832 acres. This disturbance represents approximately 3 percent of the total past, present, and RFFAs disturbance. It is assumed that portions of past mine-related disturbances in the CESA have been reclaimed, and ongoing reclamation at existing operations would continue. The incremental additional impacts to vegetation as a result of the proposed project would be temporary in nature for the majority of the project disturbance area, with the exception of open pits, which would not be reclaimed.

Other surface disturbing activities in the CESA that contribute to cumulative effects of vegetation resources include the establishment and spread of noxious weeds and non-native invasive plant species, livestock grazing, and wildfires. Cumulative losses for vegetation resources potentially would include the reduction of native ecosystem functions such as soil stability, erosion control, livestock and wildlife forage, and wildlife habitat. The removal of woody species from these areas would result in a long-term change in vegetation structure since it may take up to 15 to 25 years for shrub species of similar stature to become re-established in these areas. Indirect impacts to vegetation resources associated with surface disturbance activities would include fugitive dust accumulation, and introduction and spread of noxious weeds or non-native invasive plant species. Fugitive dust from development activities can adversely impact native vegetation communities and alter vegetative composition. The cumulative effects of noxious weeds and non-native invasive plant species are discussed in Section 3.15, Noxious Weeds and Non-native Invasive Plant Species.

Livestock grazing has and would continue to influence vegetation composition and structure throughout the CESA. Potential for overgrazing may increase as vegetation is lost to mining activities and wildfire. Adjustment of stocking rates would account for the reduction in forage and ensure vegetation communities are not overgrazed. Within the CESA, reductions in permitted grazing use would continue to occur as a result of mine development and wildfires. Successful reclamation of mined areas and restoration of burned sites would allow for stocking rates to return to near pre-mining/pre-burn levels.

Numerous wildfires have occurred in the study area, creating additional regional impacts to vegetation within the CESA. **Figure 3.2-3** illustrates the locations of the wildfires in the region over the past 37 years, amounting to 1,476,738 acres. During the summer of 2017, approximately 202,856 acres of the CESA were burned by the Rooster Comb wildlife, including approximately 1,668 acres within the Rossi Mine PoO boundary. The cumulative effect of fires within the CESA is more pronounced because of the increased size and intensity of recent wildfires. Direct and indirect impacts to vegetation resources from wildfires include the complete loss or partial removal of upland vegetation species, potential removal of below ground biomass, soil hydrophobicity, and potential introduction and/or spread of noxious weeds or invasive plant species. See Section 3.13.3, Cumulative Impacts, for a further discussion of the effects of

wildfires on soil resources. Some burn areas have converted from sagebrush systems to cheatgrass monocultures. Increases in cheatgrass increase the fire return interval, which may permanently alter plant community structure and composition. Impacts to vegetation resources may vary depending on fire intensity, duration, and frequency. Recovery timeframes for herbaceous and woody species would be relatively similar to those previously described for other surface disturbance-related activities. Reseeding could improve vegetation structure and composition in burned areas and would benefit wildlife by providing forage, cover, and nesting habitat. Large areas affected by fire may take years to reestablish native vegetation. Planting in burned areas would provide breeding habitat, cover, and forage for a diversity of wildlife including mule deer, pronghorn, sage grouse, and pygmy rabbit.

Reclamation of mine-related disturbances in the CESA would be incremental as various operations reach the end of active mining and begin closure activities. In the CESA, permanent disturbance associated with mining would largely be associated with open pits. Areas being reclaimed on public lands would be reclaimed to BLM standards and monitored to assess success of reclamation. Grasses with low densities of native forbs and shrubs would likely be the dominant vegetation on reclaimed areas.

Previously disturbed land at the Arturo Mine, adjacent to the Rossi Mine Expansion Project, has been reclaimed with a seed mix consisting of native grasses, forbs and shrubs. These reclaimed areas maintain a diverse plant community that is self-sustaining and resistant to erosion. However, communities of big sagebrush, the most extensive pre-mining plant community, have proven difficult to re-establish on reclaimed lands when the soil characteristics do not contain the specific chemicals required by sagebrush to establish and grow (BLM 2010d).

Past, present, and RFFAs would cumulatively and incrementally reduce vegetation cover types until such time that reclamation is deemed successful and native plants are re-established. The cumulative unreclaimed disturbance area that would remain after completion of the interrelated actions, including the pit areas of the proposed project, would be a small percentage of the total land area in the CESA. Loss of mature shrubs would be minimal relative to the total acreage of woody species communities that occur within the CESA.

Riparian Zones and Wetland Areas

Surface disturbing activities in the CESA that have resulted, or would result, in cumulative effects to riparian zones and wetland areas include wildfires, mining operations, utility and energy development, and agricultural activities. Within the CESA, impacts to riparian zones and wetland areas are discussed in the NEPA documents associated with the past and current projects (BLM 2014a, BLM 2010b, BLM 2008a, BLM 2007b). Cumulative impacts to riparian zones and wetland areas within the Carlin Trend are discussed in the Final Environmental Impact Statement for the Arturo Mine Project (BLM 2014a). Cumulative impacts to riparian zones and wetland areas cannot be quantified but are discussed qualitatively.

It is anticipated that the cumulative impacts to riparian zones and wetland areas in the Carlin Trend from past, present, and RFFAs would include degradation of riparian and wetland vegetation from livestock grazing; mining (surface disturbance and dewatering activity); conversion of native riparian/wetland plant communities to communities dominated by invasive non-native species; other industrial development (e.g., power plants and power transmission corridors); service roads; wildfire; and in some cases agricultural diversions (BLM 2010d). These activities may result in the temporary or permanent loss of riparian and wetland vegetation. Wildfires have had varying impacts on riparian and wetland habitats, depending on the condition and moisture levels of the riparian zone prior to the wildfire. Grazing has affected and would continue to affect riparian zones and wetland areas to varying degrees. Depending on the level of management, livestock grazing may have minimal to extensive impacts on riparian vegetation. Grazing in the annual hot season, combined with the establishment of noxious weeds and non-native invasive plant species has an increased potential for impacts to riparian and wetland resources through loss of habitat and decrease and/or loss of vegetation.

Over the last several decades, riparian zones have generally improved throughout portions of the study area in response to changes in livestock management. As the need and opportunity for further grazing management changes are identified and implemented, riparian zones are expected to continue to improve. Although some impacts due to dewatering have occurred, riparian zones and wetland areas have been

improved and expanded in the CESA, through the Maggie Creek Watershed Restoration Project and Upper Willow Creek Habitat Enhancement Plans (BLM 2010d).

Under the proposed project the loss of the one wetland area from the King North WRDF (less than 0.1 acre) would be a very small but incremental addition to cumulative impacts to wetland areas within the CESA. Similarly, the 0.8 acre of disturbance to riparian zones would be a very small but incremental addition to cumulative impacts to riparian zones in the CESA.

Areas of wetland and riparian zone loss resulting from the Proposed Action would impact wildlife and migrating mule deer (*Odocoileus hemionus*) moving through the project area. Wetland and riparian habitat are often used by migrating mule deer and other migratory wildlife species as important seasonal stopover habitat, which provides available water and higher quality forage in comparison to other areas of migratory corridors within the Carlin Trend. Research has indicated that although stopover sites are important to completion of seasonal migrations, mule deer are not severely constrained by stopover spacing and are able to navigate both shorter and longer distances between stopovers (Sawyer and Kaufmann 2011). Details regarding impacts to mule deer are presented in Section 3.17, Wildlife and Aquatic Biological Resources.

Climate Change

Potential changes to the project area resulting from the effects of climate change forecasted by the Central Basin and Range Rapid EcoRegional Assessment (REA) could include higher than normal growing season temperatures, contraction or expansion of some existing vegetation communities, the expansion of existing noxious weed populations, and the introduction of noxious weed species previously undocumented in the ecoregion and project area (Comer et al. 2013). Regarding temperature increases specifically, the Central Basin and Range REA forecasts an average increase in average summer maximum daytime temperatures of approximately 5°F within the Rossi project area by 2060 (Comer et al. 2013). These increases in average growing season temperatures are anticipated to result in low elevation basins throughout the Central Basin and Range ecoregion potentially transitioning from the existing cool semi-desert vegetation communities into very warm and sparsely vegetated desert landscapes more typical of the Mojave Basin and Range.

A number of studies have documented a decrease in biomass and productivity resulting from climate change in the Southwest. A central New Mexico study found that the amount of above-ground plant biomass decreased as temperature increased and precipitation decreased (Anderson-Teixeira et al. 2011).On the Colorado Plateau, drought was associated with a substantial decrease in photosynthetic production of organic compounds, with summer rains rarely resulting in net increase in biomass (Bowling et al. 2010). The impact of climate change on vegetation communities within the CESA may be magnified compared to other ecosystems due to the aridity and lower resiliency of lands in the Great Basin. These lands are always “on the edge” due to extreme variation in the timing and quantity of precipitation, invasive species, altered fire regimes, and increasing development (Pellant 2007). With increasing atmospheric CO_2 levels, cheatgrass and other introduced annual grasses are expected to proliferate and continue to outcompete native species, which can be expected to increase the frequency and size of wildfires in the area (Smith et al. 2000). Ultimately, biodiversity in the CESA could be significantly reduced, which in turn might alter ecosystem processes such as primary production, nutrient dynamics, and landscape water balance.

3.14.3.2 Reconfiguration Alternative

General Vegetation

Cumulative effects under the Reconfiguration Alternative would be similar to cumulative effects associated with the Proposed Action, except that this alternative would incrementally add approximately 1,016 acres to the disturbance for a total cumulative disturbance of 41,681 acres associated with mineral exploration and mining activities within the CESA. The Reconfiguration Alternative disturbance represents approximately 3 percent of the total. Cumulative impacts to vegetation resources would be similar to those described for the Proposed Action minus 151 acres of vegetation impacts from surface disturbance.

Riparian Zones and Wetland Areas

Cumulative effects to wetland areas under the Reconfiguration Alternative would be the same as discussed under the Proposed Action. Cumulative effects under the Reconfiguration Alternative to riparian zones would result in 0.1 acre less incremental impact than the Proposed Action.

3.14.3.3 Livestock Fencing Alternative

Cumulative effects under the Livestock Fencing Alternative would be the same as discussed under the Proposed Action and Reconfiguration Alternative, except that an additional 7 acres of disturbance would result from the fence posts. Additionally, excluding livestock from the project area, where there has been evidence of frequent livestock use in wetland areas around water features, could result in livestock use increasing in wetland areas outside of the project area. Fencing would benefit the project during reclamation allowing for vegetation to establish without the stress from livestock grazing. Upon successful reclamation and revegetation as determined by BLM and NDEP, the fence would be removed.

3.14.3.1 No Action Alternative

Under the No Action Alternative, the proposed project would not be developed and no additional cumulative effects to vegetation resources or riparian zones and wetland areas would occur.

3.14.4 Potential Monitoring and Mitigation Measures

3.14.4.1 General Vegetation

The following mitigation measures are recommended for vegetation resources.

Issue: Sagebrush is an important habitat in the study area, and the loss of sagebrush communities would have impacts on area wildlife. Sagebrush communities can take several decades to reclaim and often be unsuccessful without additional reclamation measures.

Mitigation Measure V-1: Additional reclamation measures would be implemented to assist in the reclamation of sagebrush shrubland communities in the project area. Additional reclamation measures to be implemented include:

- Application of mulch;
- Inoculation with arbusucular mychorrizea;
- Growth media would be direct-placed, when possible;
- The use of imprinters and/or cultipackers; and
- Planting of sagebrush in small patches.

Effectiveness: The implementation of the additional sagebrush measures would assist in the establishment of successful sagebrush communities by favoring the establishment of big sagebrush in the project area. Big sagebrush would be favored by decreasing competition with noxious weeds through control of non-native invasive plant species, and the amelioration of site conditions through the addition of mulch, inoculation with arbusucular mychorrizea.

3.14.4.2 Riparian Zones and Wetland Areas

No mitigation measures are proposed for this resource.

3.14.5 Residual Impacts

3.14.5.1 General Vegetation

Residual impacts to vegetation would include the permanent loss of 194 acres of vegetation in previously reclaimed or undisturbed areas associated with the expansion of open pits that may not be reclaimed. Under the proposed project, the loss of shrub-dominated communities would represent a long-term

change in vegetation composition (i.e., shrub-dominated communities to grass/forb-dominated communities). In addition, fragmentation and the conversion of vegetation types would occur over the long term, depending on the success of reclamation and associated disturbances during the life of the project.

3.14.5.2 Riparian Zones and Wetland Areas

Under the Proposed Action, mining activity would result in less than 0.1 acre of disturbance to one wetland area (W-1) (**Figure 3.14-4**). The Proposed Action would also disturb 0.8 acres of riparian vegetation in the study area, which would result in complete disturbance of riparian vegetation in the study area, as the remaining 1.6 acres of riparian vegetation in the study area would be removed under existing/authorized disturbance as discussed on page 3.14-13.

3.15 Noxious Weeds and Non-native Invasive Plant Species

3.15.1 Affected Environment

The study area for noxious weeds and non-native invasive plant species includes the lands within the PoO boundary (**Figure 3.15-1**). The CESA for noxious weeds and non-native invasive plant species covers the Twenty-Five Allotment as well as the Boulder Field, T Lazy S, and Mary's Mountain grazing allotments and Boulder Creek Valley area between the T Lazy S and Twenty-Five Allotment (**Figure 3.15-2**).

Under the Federal Plant Protection Act of 2000 (formerly the Noxious Weed Act of 1974 [7 U.S.C. §2801-2814]), a noxious weed is defined as "any plant or plant product that can directly or indirectly injure or cause damage to crops, livestock, poultry, or other interests of agriculture, irrigation, navigation, the natural resources of the United States, the public health, or the environment." Invasive species are also managed under the Invasive Species Executive Order 13112, which directs federal agencies to take actions to prevent the introduction of invasive, non-native species and control their impact if introduced. The BLM Elko District developed an Integrated Weed Management Program, which incorporates manual, mechanical, herbicide treatments, prescribed fire, and biological control methods to control weeds (BLM 1998d, BLM 2011). Additionally, the Noxious Weed Act of 1974, as amended by Section 15 of the Management of Undesirable Plants on Federal Lands (1990), authorizes the Secretary of the Interior to "cooperate with other federal and state agencies and others in carrying out operations or measures to eradicate, suppress, control, prevent, or retard the spread of any noxious weed." The provisions of the act direct the agencies to consider noxious weeds when considering impacts of surface disturbing activities.

The State of Nevada also regulates noxious weeds. Under the NRS, a noxious weed is defined as "any species of plant which is, or is likely to be, detrimental or destructive and difficult to control or eradicate" (NRS 555.005 – Control of insects, pests, and noxious weeds). Noxious weeds have become a growing concern in Nevada, based on their ability to increase in cover relative to surrounding vegetation and exclude native plants from an area. Noxious weeds are classified into three categories based on the statewide importance, distribution, and the ability of eradication or control measures to be successful (see **Table 3.15-1** at footnote 1). A list of the noxious weed species designated by the State of Nevada is provided in **Table 3.15-1**.

Table 3.15-1. State of Nevada Noxious Weeds

Common Name	Scientific Name	Category[1]
African rue	*Peganum harmala*	A
Austrian fieldcress	*Rorippa austriaca*	A
Black henbane	*Hyoscyamus niger*	A
Camelthorn	*Alhagi camelorum*	A
Common crupina	*Crupina vulgaris*	A
Common St. Johnswort	*Hypericum perforatum*	A
Crimson fountain grass	*Pennisetum setaceum*	A
Dalmation toadflax	*Linaria dalmatica*	A
Dyer's woad	*Isatis tinctoria*	A
Eurasian water-milfoil	*Myriophyllum spicatum*	A
Giant reed	*Arundo donax*	A
Giant salvinia	*Salvinia molesta*	A

Table 3.15-1. State of Nevada Noxious Weeds

Common Name	Scientific Name	Category[1]
Goatsrue	*Galega officinalis*	A
Houndstongue	*Cynoglossum officinale*	A
Hydrilla	*Hydrilla verticillata*	A
Iberian starthistle	*Centaurea iberica*	A
Malta star thistle	*Centaurea melitensis*	A
Mayweed chamomile	*Anthemis cotula*	A
Mediterranean sage	*Salvia aethiopis*	A
Purple loosestrife	*Lythrum salicaria, L. virgatum* and their cultivars	A
Purple starthistle	*Centaurea calcitrapa*	A
Rush skeletonweed	*Chondrilla juncea*	A
Sow thistle	*Sonchus arvensis*	A
Spotted knapweed	*Centaurea masculosa*	A
Squarrose knapweed	*Centaurea virgata*	A
Sulfur cinquefoil	*Potentilla recta*	A
Swainsonpea	*Sphaerophysa salsula*	A
Syrian bean caper	*Zygophyllum fabago*	A
Yellow star thistle	*Centaurea solstiltialis*	A
Yellow toadflax	*Linaria vulgaris*	A
African mustard	*Brassica tournefortii*	B
Diffuse knapweed	*Centaurea diffusa*	B
Leafy spurge	*Euphorbia esula*	B
Medusahead	*Taeniatherum caput-medusae*	B
Musk thistle	*Carduus nutans*	B
Russian knapweed	*Acroptilon repens*	B
Sahara mustard	*Brassica tournefortii*	B
Scotch thistle	*Onopordum acanthium*	B
Silverleaf nightshade	*Solanum elaeagnifolium*	B
Canada thistle	*Cirsium arvense*	C
Hoary cress	*Cardaria draba*	C
Johnsongrass	*Sorghum halepense*	C
Perennial pepperweed	*Lepidium latifolium*	C
Poison-hemlock	*Conium maculatum*	C
Puncture vine	*Tribulus terrestris*	C

Table 3.15-1. State of Nevada Noxious Weeds

Common Name	Scientific Name	Category[1]
Salt cedar (tamarisk)	*Tamarix* spp.	C
Spotted water hemlock	*Cicuta maculata*	C

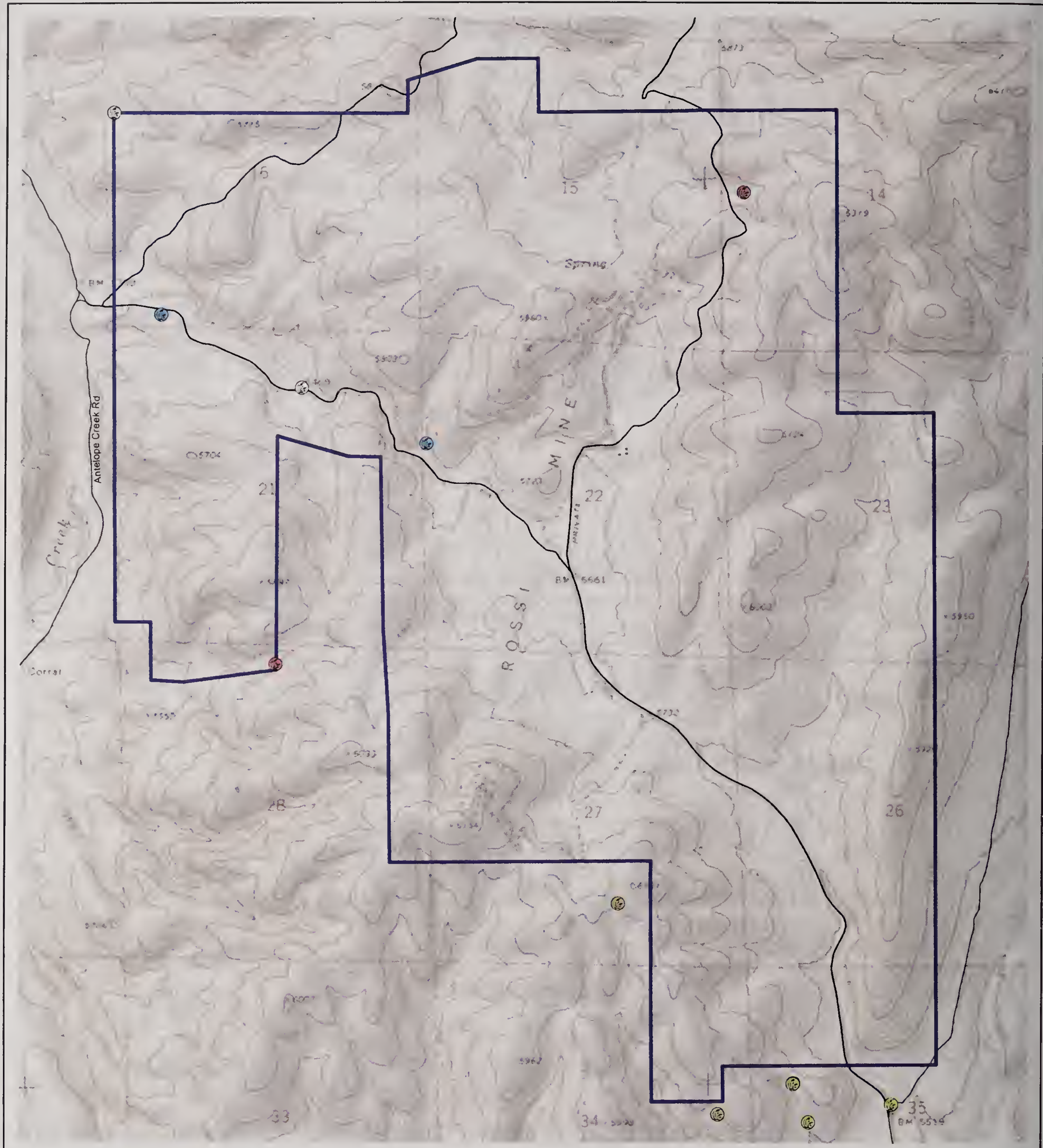
Source: Nevada Department of Agriculture 2012.

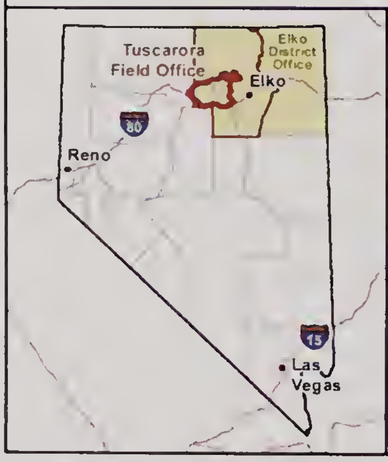
[1] **Category A** includes weeds that are generally not found or that are limited in distribution throughout the state subject to a) active exclusion from the state and active eradication wherever found and b) active eradication from the premises of a dealer of nursery stock.
Category B includes weeds that are generally established in scattered populations in some counties of the state subject to a) active exclusion where possible and b) active eradication from the premises of a dealer of nursery stock.
Category C includes weeds that are generally established and generally widespread in many counties of the state subject to active eradication from the premises of a dealer of nursery stock.

Recognizing these regulations, the BLM requires that NEPA documents consider and analyze the potential for the spread of noxious weed species and provide preventative rehabilitation measures for each management action involving surface disturbance. The BLM considers plants invasive if they have been introduced into an environment where they did not evolve. As a result, they usually have no natural enemies to limit their reproduction and spread (Westbrooks 1998).

A total of three State of Nevada listed noxious weeds were recorded within the study area during field surveys (SRK 2013b, BLM 2015h). In addition, two species considered invasive and related to State of Nevada noxious weeds were observed during the survey. These observations include one location of hairy whitetop (*Cardaria pubescens*), adjacent to a gravel county road and an ephemeral drainage, and one location of bull thistle (*Cirsium vulgare*) at an impoundment (SRK 2013b), and two locations of spotted knapweed (*Centaurea masculosa)* (BLM 2015h) (**Figure 3.15-1**). Previous surveys have also observed two locations of scotch thistle (*Onopordum acanthium*) and three locations of hoary cress (*Cardaria draba*) immediately to the south of the Rossi Mine PoO boundary along the Boulder Valley Road (BLM 2015h) (**Figure 3.15-1**). The study area also includes introduced annual grassland (predominantly cheatgrass), mostly occurring in areas that have been previously disturbed and reclaimed.

Surveys of the Arturo Mine site, which is located adjacent to the study area, documented noxious weeds in areas where existing disturbance existed, including scotch thistle, salt cedar, and bull thistle (BLM 2014a). At the time of those surveys (2009), Scotch thistle populations were most prominent and occurred throughout the existing disturbance area, including exploration roads, with control measures for this species being implemented in order to control or eradicate the species. Control measures for salt cedar were also being implemented to success. Bull thistle populations generally occurred along the periphery of the constructed wetlands areas (BLM 2014a). **Figure 3.15-2** illustrates documented existing noxious weeds and non-native plant species in the CESA.





- Project Study Area
- Bull Thistle
- Hairy Whitetop
- Hoary Cress
- Scotch Thistle
- Spotted Knapweed

Source. BLM 2015h, SRK 2013b, SRK 2014a.

Rossi Mine Expansion Project EIS

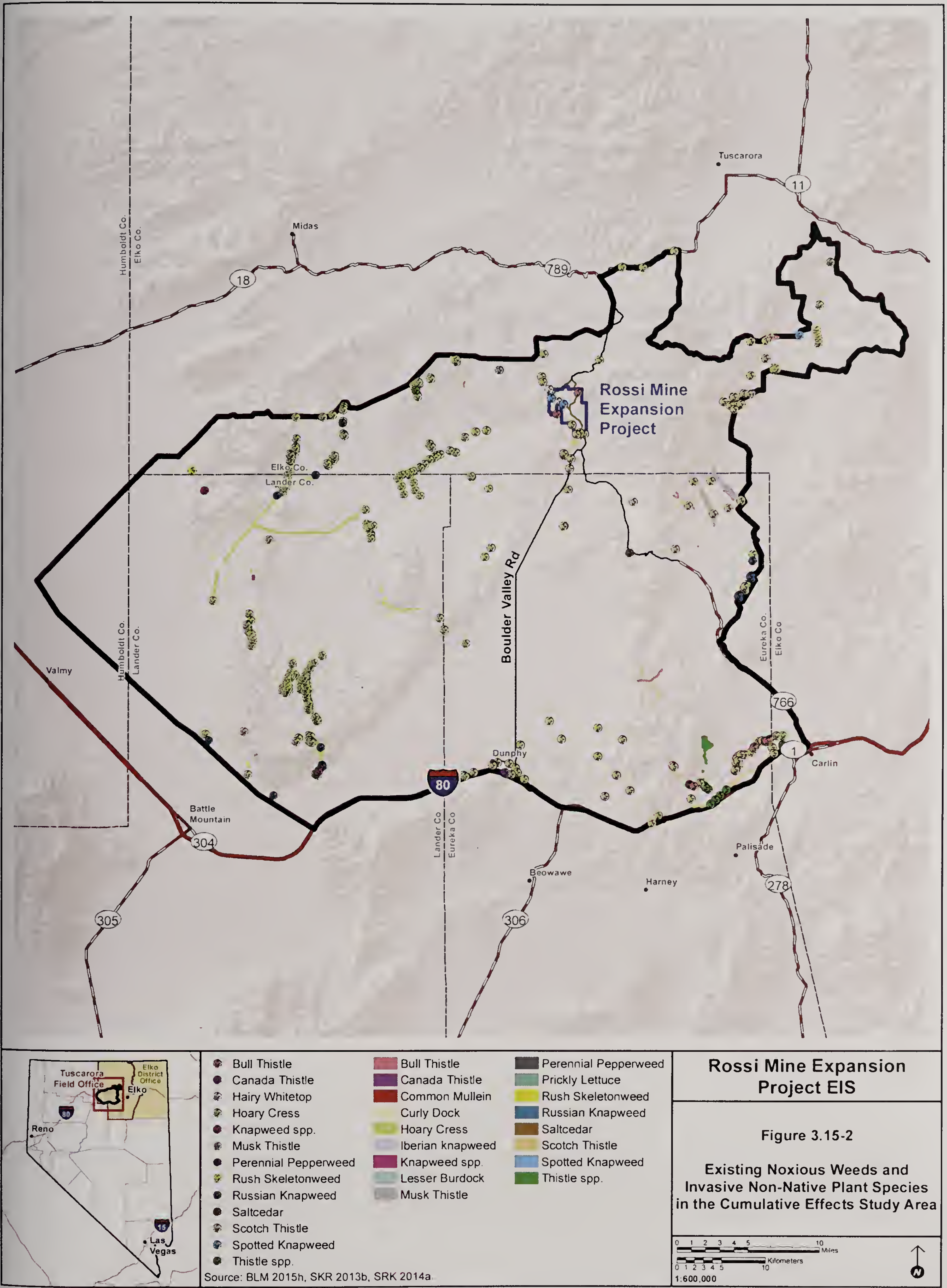
Figure 3.15-1

Existing Noxious Weeds and Invasive Non-Native Plant Species within the Project Study Area

0 0.1 0.2 0.3 0.4 0.5 Miles
0 0.25 0.5 0.75 1 Kilometers
1:30,000

10/11/2017

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notice.



Rossi Mine Expansion Project EIS

Figure 3.15-2

Existing Noxious Weeds and Invasive Non-Native Plant Species in the Cumulative Effects Study Area

10/11/2017

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data
Original data were compiled from various sources. This information may not meet National Map Accuracy Standards.
This product was developed through digital means and may be updated without notice.

3.15.2 Environmental Consequences

3.15.2.1 Proposed Action

Under the proposed project, mine development and operation would disturb approximately 1,167 acres from surface disturbance activities. Approximately 206 acres would occur in areas of existing disturbance and 961 acres would occur in previously undisturbed areas. The majority of the disturbance would occur in the sagebrush shrubland land cover type.

Following surface disturbance activities, noxious weeds and non-native invasive plant species may readily colonize areas that typically lack or have minimal vegetation cover. Noxious weed seed and plant material can be transferred into the project area via livestock, wildlife, vehicles, equipment, and the wind. Noxious weed and invasive plant species that occur in the project vicinity and along the Boulder Valley, Antelope Creek, and Boulder-Antelope Connector Roads are the species most likely to become established within areas of surface disturbance. It is anticipated that minor populations of weedy annual species (e.g., halogeton, cheatgrass) may become established in localized areas for extended periods of time. Surface disturbance and increased vehicle travel along new routes may readily spread noxious weeds and non-native invasive plant species and colonize areas that have minimal vegetative cover or that have been recently disturbed. Noxious weed species can degrade and modify native communities, reduce resources for native species, monopolize limited sources of moisture, and adversely affect native pollinators. In addition, noxious weeds and non-native invasive plant species can reduce wildlife habitat, alter fire regimes, and degrade wetland and riparian areas.

Implementation of the Rossi Mine Noxious and Invasive Weed Management Plan (HES 2016i), Applicant Committed Environmental Protection Measures, and HES' reclamation measures would reduce the potential for noxious weeds and non-native invasive plant species establishment in the study area. All surface disturbance would be reclaimed either concurrently during operations as areas become available or once mining is complete. HES' PoO and Noxious and Invasive Weed Management Plan includes management strategies and control techniques to prevent or minimize the establishment or spread of weed populations. The HES is available as an appendix to the Rossi Mine PoO on file with the BLM Elko District Office. Noxious weed management would continue during the post-mining reclamation period and the post-closure monitoring period.

As summarized in Section 2.3.12.3, Reclamation of Proposed Project Facilities, HES would implement BMPs outlined in the Rossi Mine Noxious and Invasive Weed Management Plan to prevent the spread of noxious weeds, which would include seeding growth media stockpiles as soon as practical with an interim seed mix and using certified weed-free seed mixture, and washing all vehicles that have been off-road and possibly exposed to noxious weed seeds at designated wash areas (HES 2016i). Seeding the growth media stockpiles with the interim seed mix would stabilize the growth media and reduce soil erosion in addition to minimizing the potential for the establishment of noxious weeds and non-native invasive plant species. Successful reclamation of mine-related disturbance areas (except for open pits) would result in the establishment of a permanent vegetative cover, which would minimize the potential establishment of noxious weeds and non-native invasive plant species in the long term. Open pits would not be reclaimed; however, due to the absence of soils, the potential for establishment of noxious weeds and non-native invasive plant species would be less likely.

3.15.2.2 Reconfiguration Alternative

The Reconfiguration Alternative would be similar to the Proposed Action, except sequencing of the construction and reclamation of the Dawn Pit would be conducted to reduce the duration of surface disturbance at this location. Additionally, construction of the QLC Pit and WRDFs would be modified from the Proposed Action to maintain a minimum 2000-foot-wide undisturbed corridor for mule deer migration between the proposed Dawn WRDF and the Arturo Mine facilities to the south as shown in **Figure 2-8**. Overall, this alternative would result in approximately 151 fewer acres of disturbance in the study area. As a result, the potential for the introduction or spread of noxious weeds and non-native invasive plant species would be less than the Proposed Action since 151 fewer acres would be disturbed.

3.15.2.3 Livestock Fencing Alternative

The environmental consequences for the Livestock Fencing Alternative would be similar to the Proposed Action and Reconfiguration Alternative, except that constructing a fence around the PoO area could increase the risk of spreading invasive non-native species to these areas, especially if vehicles are driven off road to install the fence. In the long-term, excluding livestock from the PoO area could help prevent the spread of non-native invasive plant species in the study area, since the seeds of non-native invasive plant species could not be carried into the PoO area by cattle. The fence would be removed once the mine is reclaimed and revegetation is determined successful by the BLM and NDEP.

3.15.2.4 No Action Alternative

Under the No Action Alternative, the proposed project would not be developed and subsequent impacts associated with the introduction or spread of noxious weeds and non-native invasive plant species would not occur. Continuation of mining activities associated with the Rossi Mine, completion of closure and reclamation activities associated with existing disturbance, and ongoing mineral exploration activities within the study area, would be conducted under existing authorizations and the spread of noxious weeds and non-native invasive plant species may occur. Existing weed control measures would continue to be implemented to prevent the establishment of new populations and to control existing populations in mine-related disturbance areas.

3.15.3 Cumulative Impacts

The CESA for noxious weeds and non-native invasive plant species is described in Section 3.15.1, Affected Environment, and is shown in **Figure 3.15-2**. The past, present, and RFFAs are discussed in Section 3.2, Past, Present and Reasonably Foreseeable Future Actions. RFFAs for mining and exploration activities are identified in **Table 3.2-1**; their locations are shown in **Figure 3.2-1** and **Figure 3.2-2**. **Figure 3.2-2** also illustrates some ROW actions.

3.15.3.1 Proposed Action

Past, present, and RFFAs in the CESA have resulted, or would result, in approximately 40,587 acres of mine and exploration related surface disturbance, including 395 acres of sand and gravel mining operations. Past, present, and RFFAs from utility and energy development including the North Elko Pipeline and TS Power Plant have resulted, or would result, in up to 379 acres of additional disturbance. The Proposed Action including exploration within the project area would incrementally increase disturbance by an additional 1,167 acres for a total cumulative disturbance of 41,754 acres. This disturbance represents approximately 3 percent of the total past, present, and RFFAs disturbance. Noxious weeds and non-native invasive plant species currently exist in the CESA (**Figure 3.15-2**). Surface disturbance activities from implementation of the proposed project as well as other future projects could further spread noxious weeds and non-native invasive plant species into previously undisturbed areas, and may increase the acreage and population numbers of already established noxious weeds and non-native invasive plant species populations. Other surface disturbing activities in the CESA that contribute to the cumulative spread of noxious weeds and non-native invasive plant species include livestock grazing, wildfire, all-terrain vehicles, wildlife and recreation use.

It is anticipated that the cumulative impacts to noxious weeds and non-native invasive plant species in the CESA from past, present, and RFFAs would result in the potential for the introduction of new noxious weed and non-native invasive plant species in addition to the increased spread of these species into disturbed areas created from surface disturbances associated with grazing, wildfires, recreational use and the development of mining projects and utility corridors. Linear surface disturbances such as utility corridors, roads, and trails provide corridors for further introduction and spread of noxious weeds and non-native invasive plant species (Gelbard and Belnap 2003, Watkins et al. 2003). These networks of corridors can then serve as a source of propagules (D'Antonio et al. 2001) for noxious weeds and non-native invasive plant species to spread into adjacent undisturbed areas.

It is assumed that the majority of the surface disturbance-related impacts within the CESA would be reclaimed, minimizing the introduction and/or spread of noxious weeds and non-native invasive plant species. HES would implement measures to minimize the introduction and/or spread of noxious weeds and non-native invasive plant species within the proposed project disturbance areas, thereby minimizing the project's contribution to cumulative effects.

Climate Change

Potential changes to the project area resulting from the effects of climate change forecasted by the Central Basin and Range REA could include higher than normal growing season temperatures, contraction or expansion of some existing vegetation communities, the expansion of existing noxious weed populations, and the introduction of noxious weed species previously undocumented in the ecoregion and project area (Comer et al. 2013). Regarding temperature increases specifically, the Central Basin and Range REA forecasts an average increase in average summer maximum daytime temperatures of approximately 5°F within the project area by 2060 (Comer et al. 2013). These increases in average growing season temperatures are anticipated to result in low elevation basins throughout the Central Basin and Range ecoregion potentially transitioning from the existing cool semi-desert vegetation communities into very warm and sparsely-vegetated desert landscapes more typical of the Mojave Basin and Range.

Increasing temperature and longer growing season could further result in expansion of invasive annual grass and forb species into elevations where they are currently limited or the replacement of one existing exotic annual grass with another. These shifts in species compositions have potential to introduce novel effects on local fire regimes in vegetation communities such as montane sagebrush steppe and higher elevation woodland and forest (Abatzoglou and Kolden 2011; Rivera et al. 2011).

3.15.3.2 Reconfiguration Alternative

Cumulative effects under the Reconfiguration Alternative would be similar to cumulative effects associated with the Proposed Action, except that this alternative would add approximately 1,016 acres of new disturbance, which is 151 acres less than the Proposed Action, resulting in a total cumulative disturbance of 41,603 acres. This smaller amount of surface disturbance represents a smaller incremental impact to the cumulative effects of non-native invasive species.

3.15.3.3 Livestock Fencing Alternative

Cumulative effects acreages under the Livestock Fencing Alternative would be the same as the cumulative effects associated with the Proposed Action and the Reconfiguration Alternative with the addition of 7 acres of surface disturbance resulting from fence installation. Upon successful reclamation and revegetation as determined by BLM and NDEP, the fence would be removed.

3.15.3.4 No Action Alternative

Under the No Action Alternative, the proposed project would not be developed and no additional cumulative effects from noxious weeds and non-native invasive plant species would occur.

3.15.4 Potential Monitoring and Mitigation Measures

HES would monitor revegetation success and for the presence of noxious and non-native invasive plant species. HES would treat noxious and non-native invasive plant species found within the PoO boundary that are associated with the mine and mineral surface disturbance as described in their weed management plan. No additional mitigation measures are recommended for noxious weeds and non-native invasive plant species.

3.15.5 Residual Impacts

Noxious weeds and non-native invasive plant species may persist over the long term regardless of the implementation of weed control programs.

3.16 Range Resources

3.16.1 Affected Environment

The study area for range resources comprises the area within the proposed PoO boundary and the area potentially encompassed under the Livestock Fencing Alternative. These are the areas in which direct and indirect project-related impacts to range resources are most likely to occur. The CESA for range resources includes the Twenty-Five Allotment as well as the Boulder Field, Tuscarora, T Lazy S, and Mary's Mountain grazing allotments—the allotments in which cumulative impacts to range resources from past, present, and reasonably foreseeable mining and exploration activities along the Carlin Trend are most likely to occur. **Figure 3.16-1** depicts the study area and CESA boundaries for range resources. **Table 3.16-1** summarizes key characteristics of grazing allotments within the CESA.

The study area is located within and encompasses approximately 1 percent of the total land area of the Twenty-Five Allotment, which is the only grazing allotment within the study area. The Twenty-Five Allotment includes approximately 309,390 acres of public land and 214,693 acres of private land totaling 524,083 acres (BLM 2015c). One operator, 26 Ranch, LLC, is currently permitted by the BLM to graze cattle and horses in approximately 30 different pastures within the allotment during different seasons of use (BLM 2015c). The BLM coordinates with the operator to determine grazing management for the Twenty-Five Allotment, including individual pastures, on an annual basis. Grazing by horses is restricted under the permit to the periods between March 1 and April 30, May 1 and May 3, and December 1 to February 28. One AUM represents the amount of forage necessary for the sustenance of one cow or its equivalent (e.g., one cow and her calf, one horse) for a period of one month (43 CFR 4100.0-5). Grazing preference is the total number of AUMs, including AUMs in active use and suspension, apportioned to livestock grazing use. The grazing preference takes into account areas determined by the BLM as unsuitable for livestock grazing because of low production, lack of water, or other uses (e.g., trailing) as well as competition with wildlife and wild horses. Suspended AUMs on public lands are not authorized for use, usually because of poor rangeland conditions, and may only be removed from suspension under the provisions of the grazing regulations at 43 CFR 4110.3-1(b) or made temporarily available through a non-renewable use permit under 43 CFR 4110.3-1(a). The grazing preference for the Twenty-Five Allotment is 55,215 AUMs; 34,130 AUMs are in active use and 13,878 AUMs are suspended from use (BLM 2015c). Refer to Section 3.14, Vegetation, including Riparian Zones and Wetland Areas, for information on vegetation communities within the vicinity of the proposed project.

The study area contains a stock water trough, which is located approximately 0.3 mile south of a stock pond. This trough provides fresh water to livestock and wildlife. The BLM's range improvement inventory database for the Elko District Office does not identify any other range improvements within the study area (BLM 2015c); however, there are two fences near the eastern and southeastern boundaries of the study area and numerous range improvements, such as water wells, guzzlers, water troughs, and livestock ponds present throughout the CESA, as shown in **Figure 3.16-1**.

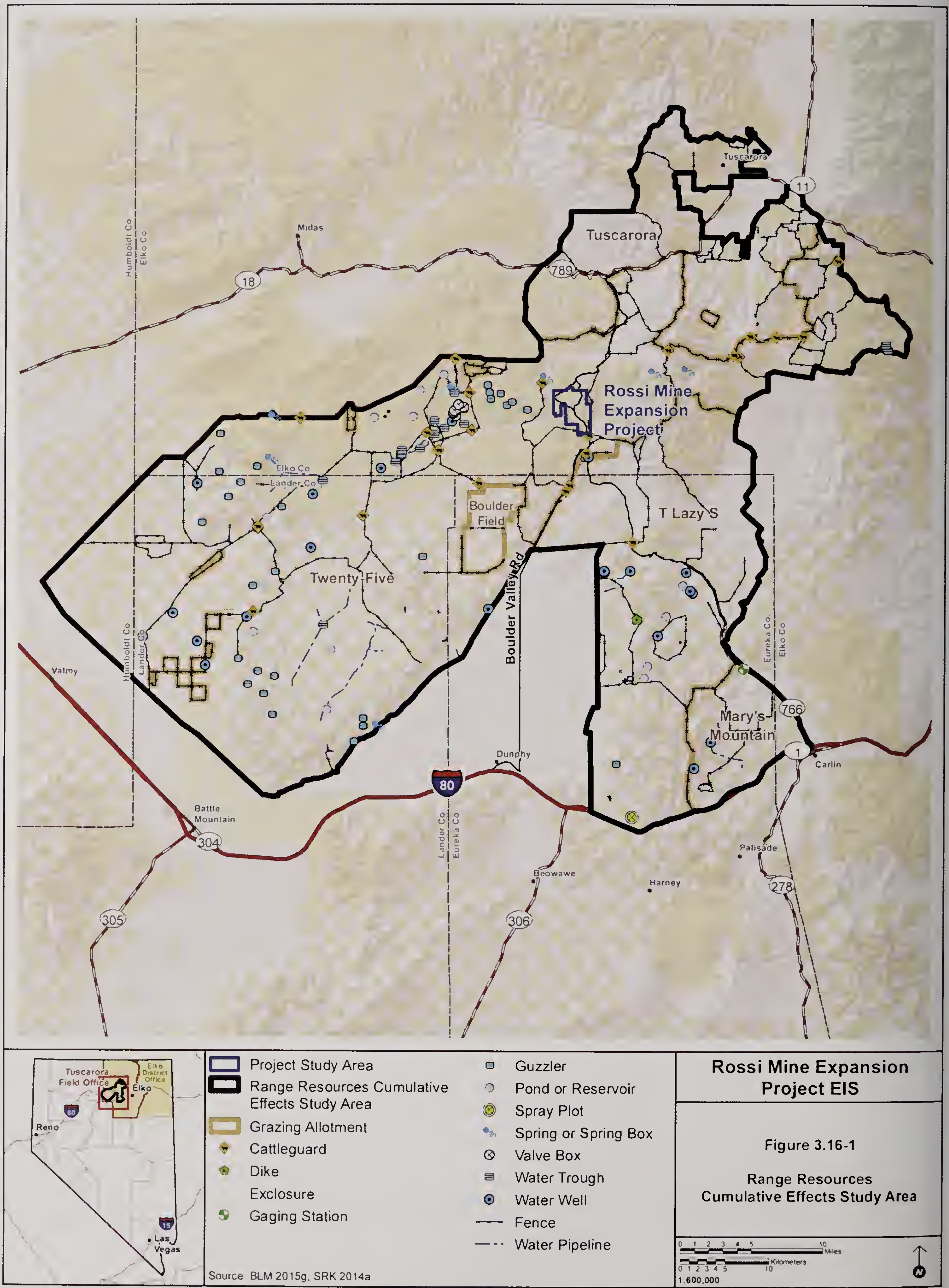


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Figure 3.16-1

Range Resources Cumulative Effects Study Area

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Table 3.16-1. Grazing Allotments in the Study Area and CESA

Grazing Allotment Name	Allotment Acreage within the Study Area	Allotment Acreage within the CESA	Percent of Public Land in Total Allotment	Total Allotment Active AUMs[1,2]	Type of Livestock	General Season of Use	Category[3]
Boulder Field	0	11,893	51	838	Cattle	March 1 – May 31	Maintain
Mary's Mountain	0	34,949	51	1,408	Cattle	February 15 – October 31	Custodial
T Lazy S	0	176,875	44	11,907	Cattle	February 15 – November 30	Improve
Tuscarora	0	98,830	50	9,166	Cattle/ Horses	March 1 – December 15	Improve
Twenty-Five Allotment	3,731	524,083	67	34,130	Cattle/ Horses	March 1 – February 28	Improve

Source: BLM 2015c.

[1] One AUM represents the amount of forage necessary for the sustenance of one cow or its equivalent for a period of 1 month (43 CFR 4100.0-5).
[2] Actual use of forage is typically less than the amount authorized (i.e., active AUMs) because forage availability and demand vary based on factors such as drought, wildfire, and market conditions.
[3] The BLM categorizes the level of management required to properly administer each grazing allotment from low to high as custodial, improve,, or maintain in accordance with BLM Handbook 1740-1, Rel. 1-1509 (BLM 1987b), which has been augmented with additional criteria from BLM IM No. 2009-018 (BLM 2008d).

3.16.2 Environmental Consequences

Primary range resource issues include the proliferation of noxious weeds and non-native invasive plant species, suspension of active AUMs due to loss of forage from the proposed surface disturbance or exclusionary fencing, reduced access to existing water sources, and interference with seasonal livestock movement within the Twenty-Five Allotment.

3.16.2.1 Proposed Action

Direct impacts on range resources could result from project-related activities that disturb or exclude livestock from foraging areas, increase the risk of vehicular collisions with livestock, or expose livestock to hazardous chemicals or construction zone hazards. Indirect impacts from project-related activities that could affect livestock grazing are fugitive dust, which can affect forage quality and livestock health, or an increase in the establishment and spread of non-native invasive plant species and noxious weeds that are unpalatable or poisonous to livestock. These types of impacts would be adverse due to their potential to displace, injure, or kill livestock. Beneficial impacts could result from the development of additional water sources for livestock and the successful revegetation of existing disturbance through concurrent and final reclamation, which over the long term (approximately 3-5 years after reclamation), could increase the availability of forage for livestock within the project vicinity.

Expansion of existing operations at the Rossi Mine would result in 1,167 acres of new surface disturbance and a total of 2,063 acres of surface disturbance, which would reduce lands available for livestock grazing until they are reclaimed following the cessation of active mining activities. As shown in **Table 3.16-2**, 1,167 acres of surface disturbances are equivalent to a reduction of approximately 107 AUMs in the Twenty-Five Allotment. Upon cessation of mining activities and successful completion of reclamation, suspended AUMs would be returned to active status as determined by the BLM.

Increased project-related vehicle traffic, primarily on Antelope Creek and Boulder Valley roads, could increase the risk of vehicular collisions with livestock. To reduce the risk of collisions and minimize fugitive

dust emissions, HES has committed to applying gravel and water treatment to roads. These applications would minimize impacts to adjacent forage and livestock health.

Project-related disturbance and vegetation removal could increase the area's susceptibility to the colonization and spread of noxious weeds and/or non-native invasive plant species. These impacts could result in the conversion of native vegetation communities, which would reduce the amount of forage available to livestock. HES would assume responsibility for noxious weed control within the study area and would apply measures described in the Noxious and Invasive Weed Management Plan (HES 2016h) to minimize the potential for the spread of non-native plant species and/or noxious weed species, including the use of approved certified weed-free seed mixture, implementation of prompt and appropriate revegetation techniques, and establishing designated wash areas for vehicles and equipment exposed to possible noxious weed seeds. If invasive species or noxious weeds spread beyond the study area or if weed control measures are unsuccessful, adverse impacts could still occur. Discussion of non-native plant species is presented in Section 3.15, Noxious Weeds and Non-native Invasive Plant Species.

HES would protect existing range improvements in the study area, if applicable, which include a stock water trough and stock pond, from damage related to the proposed project. The stock water trough may require removal due to interfering with the mining operation and the stock pond would be reclaimed when no longer needed as it is a component of the water system. However, increased vehicle traffic, construction, and ongoing operational activities could limit access or cause livestock to avoid these water sources, even if they are functioning properly. Water sources outside the proposed PoO boundary would remain accessible for livestock.

Table 3.16-2. Acreage of Surface Disturbance and Forage Loss in Twenty-Five Allotment

Alternative	Allotment Acreage Excluded from Grazing	Projected Active AUMs Lost[1]	Percent Loss of Total Active AUMs in Allotment
Proposed Action	1,167	107	<1%
Reconfiguration Alternative	1,016	93	<1%
Livestock Fencing Alternative	2,967	272	<1%
No Action Alternative	908	112	<1%

[1] One AUM represents the amount of forage necessary for the sustenance of one cow or its equivalent for a period of 1 month (43 CFR 4100.0-5). Projected AUM loss was calculated based on the acres of project-related surface disturbance and other areas excluded from livestock grazing under each alternative multiplied by the average stocking rate of 10.9 acres per AUM for the Twenty-Five Allotment (i.e., total allotment acres / total grazing preference AUMs).

3.16.2.2 Reconfiguration Alternative

Direct and indirect impacts to range resources would be the same as described for the Proposed Action, except for the following:

- Under the Reconfiguration Alternative approximately 1,016 acres of new surface disturbance would be added to the 896 acres of previously authorized disturbance for a total of 1,912 acres. This represents approximately 151 less acres of disturbance under the Reconfiguration Alternative in comparison to the Proposed Action. The estimated AUM loss for the Reconfiguration Alternative would be 93 AUMs, or 14 fewer AUMs than the Proposed Action. Because this difference of 14 AUMs represents a small fraction (less than 1 percent) of the total active AUMs in the Twenty-Five Allotment, no notable difference in the level of impacts is anticipated.

3.16.2.3 Livestock Fencing Alternative

Direct and indirect impacts to range resources would be the same as described for the Proposed Action, except for the following:

- Installation of a perimeter fence around the mine facilities would result in the exclusion of livestock from approximately 1,804 more acres than the Proposed Action. The estimated forage

lost under the Reconfiguration Alternative would be 272 AUMs, or 165 more AUMs than the Proposed Action. Although this would reduce the amount of available forage in comparison to the Proposed Action. The total AUM loss under the Livestock Fencing Alternative still represents less than 1 percent of the total active AUMs in the Twenty-Five Allotment. Therefore, no notable difference in the level of impacts due to direct forage loss is anticipated.

- The perimeter livestock fence would prevent livestock from accessing the existing stock water trough and stock pond within the project site.
- The perimeter fence would exclude livestock from grazing within areas where they may be exposed to hazardous chemicals, construction vehicles and mining equipment, and other hazards associated with an active mining area, reducing the potential for adverse impacts in comparison to the Proposed Action.

The fence would be removed once the mine is reclaimed and revegetation is determined successful by the BLM and NDEP.

3.16.2.4 No Action Alternative

Effects of past and ongoing activities at Rossi Mine were addressed in prior environmental analyses listed in **Table 2-1**. Ongoing mining activities at Rossi Mine would continue to exclude lands from livestock grazing use, including 912 acres of existing authorized surface-disturbance, until they are reclaimed following the cessation of active mining activities. However, the proposed project would not be developed and no additional forage loss; increases in project-related vehicle traffic, noise, and dust; or increased risk of exposure to hazardous chemicals or construction zone hazards would occur. Therefore, impacts from ongoing development at Rossi Mine would be similar to baseline conditions described in Section 3.16.1, Affected Environment, and would gradually diminish with concurrent reclamation, final closure, and final reclamation of the Rossi Mine.

3.16.3 Cumulative Impacts

The CESA for range resources is defined in Section 3.16.1, Affected Environment, and is shown in **Figure 3.16-1.** Past, present, and RFFAs for mining and mineral exploration activities are identified in **Table 3.2-1** and their locations are shown in **Figure 3.2-1 and Figure 3.2-2**. **Figure 3.2-2** also illustrates some ROW actions.

3.16.3.1 Proposed Action

Table 3.16-1 summarizes key characteristics of grazing allotments within the CESA: Boulder Field, Mary's Mountain, T Lazy S, Tuscarora, and Twenty-Five Allotment. These allotments include a total of 57,449 active AUMs, where cattle grazing constitutes the majority of the active grazing preference. Roughly half of the acreage of each allotment is composed of federal lands.

Past, present, and RFFAs within the CESA have resulted, or would result, in approximately 42,437 acres of surface disturbance from mining exploration and development projects for locatable and salable minerals. Past, present, and RFFAs from utility and energy development have resulted, or would result, in up to 145 acres of additional disturbance, for a total cumulative disturbance of 42,582 acres. The Proposed Action disturbance of 1,167 acres represents approximately 3 percent of the total estimated disturbance from past, present, and RFFAs. Based on the estimated stocking rate for each allotment in the CESA, surface-disturbing activities associated with past, present, and RFFAs would result in the loss of 2,998 AUMs from the active grazing preference. The Proposed Action would reduce the active grazing preference by an additional 107 AUMs. Adding the incremental disturbance from the Proposed Action to past, present, and RFFAs would result in total loss of 3,104 AUMs from the active grazing preference, or approximately 4 percent of the AUMs within the CESA. Adverse cumulative effects to livestock grazing could include increased potential for establishment and spread of noxious and invasive plants and vehicle traffic. These effects could occur across a much larger area than the proposed disturbance area.

Climate Change

Climate change appears to be influencing both natural and managed ecosystems within northern Nevada. Recent warming in the Southwest is among the most rapid in the nation, significantly more than the global average in some areas (USGCRP 2009). Projections suggest continued strong warming in the region, with significant increases in temperature (USGCRP 2009) and decreases in precipitation (Seager et al. 2007). Potential changes to the project area resulting from the effects of climate change forecasted by the Central Basin and Range REA could include higher than normal growing season temperatures, contraction or expansion of some existing vegetation communities, the expansion of existing noxious weed populations, and the introduction of noxious weed species previously undocumented in the ecoregion and project area (Comer et al. 2013). These increases in average growing season temperatures are anticipated to result in low elevation basins throughout the Central Basin and Range ecoregion potentially transitioning from the existing cool semi-desert vegetation communities into very warm and sparsely vegetated desert landscapes more typical of the Mojave Basin and Range. Under such conditions the reduction of forage vegetation and available water may make livestock operations within the CESA unfeasible.

3.16.3.2 Reconfiguration Alternative

Cumulative impacts to range resources would be the same as described for the Proposed Action, with the exception of a reduction of 151 acres that would not be developed under the Reconfiguration Alternative.

3.16.3.3 Livestock Fencing Alternative

Cumulative impacts to range resources under the Livestock Fencing Alternative would be the same as described for the Proposed Action and Reconfiguration Alternative, except it would restrict livestock movements and inhibit herding practices. Upon successful reclamation and revegetation as determined by BLM and NDEP, the fence would be removed.

3.16.3.4 No Action Alternative

Under the No Action Alternative, past and present actions would continue as approved and RFFAs would be evaluated prior to approval. The proposed project would not be approved or implemented; therefore, no additional effects on range resources would occur from the Proposed Action. Effects of the No Action Alternative on range resources have been addressed in prior environmental analyses of past and present actions and the effects of RFFAs would be addressed through future analyses. Failing to approve the proposed project would not alter those effects, so there would be no cumulative effects on range resources from the No Action Alternative.

3.16.4 Potential Monitoring and Mitigation Measures

Issue: The proposed project could impede seasonal cattle movements between summer and winter grazing areas and depending on the alternative selected, may prevent livestock from accessing existing water sources within the proposed PoO boundary.

Mitigation Measure R-1: Coordinate with Twenty-Five Allotment permittee and the BLM to identify measures to facilitate cattle movement during seasonal cattle drives and evaluate the need to develop additional livestock water sources.

Effectiveness: The success of this measure in reducing potential impacts to livestock grazing operations would depend on the level of coordination maintained between HES, the permittee, and the BLM.

Details regarding long-term post closure vegetation monitoring are provided in Section 3.13, Soils and Reclamation.

3.16.5 Residual Impacts

Residual impacts to range resources could occur if invasive species or noxious weeds spread beyond the study area or if weed control measures are unsuccessful. This would reduce the amount and quality of forage available for livestock grazing.

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3.17 Wildlife and Aquatic Biological Resources

3.17.1 Affected Environment

The study area for wildlife resources and aquatic biological resources is the project area plus a 10-mile buffer, respectively. The CESAs for wildlife resources vary depending on the species and were determined based on wildlife use within the project region and important seasonal habitats for species such as mule deer. The CESA for general wildlife species was determined based on the two hydrographic basins that overlap the study area which include Boulder Flat #61 and Rock Creek Valley #62, which extend from north of the study area in Elko County south into Lander and Eureka counties and extends southwest to the north of I-80 near Battle Mountain and southeast of I-80 near the town of Palisade (**Figure 3.17-1**). The mule deer CESA encompasses all of NDOW Management Area 6 which includes Units 61, 62, 64, 66-68 (**Figure 3.17-2**). The CESA for aquatic biological resources encompasses the Maggie Creek Area, Rock Creek Valley, and Boulder Flat hydrographic basins along the Carlin Trend (see Section 3.14, Vegetation, including Riparian Zones and Wetland Area (**Figure 3.14-5**). These three hydrographic basins drain southward into the Humboldt River.

3.17.1.1 Wildlife Resources

As discussed in Section 3.14, Vegetation, including Riparian Zones and Wetland Areas, the study area includes a variety of landcover classes, the majority of which are comprised of Inter-Mountain Basins Big Sagebrush Steppe (52 percent of the study area), Great Basin Xeric Mixed Sagebrush Shrubland (15 percent of the study area), Inter-Mountain Basins Big Sagebrush Shrubland (12 percent of the study area), and Introduced Upland Vegetation/Annual Grassland (10 percent of the study area).The remaining 11 percent is either previously developed or disturbed. Some areas previously disturbed by mining activity or wildfire have been revegetated either purposefully or through natural processes over time. Although these previously disturbed areas vary in the types and densities of existing vegetation communities, they are considered to provide some level of habitat value for local wildlife and are therefore included in the impact analysis as suitable habitat.

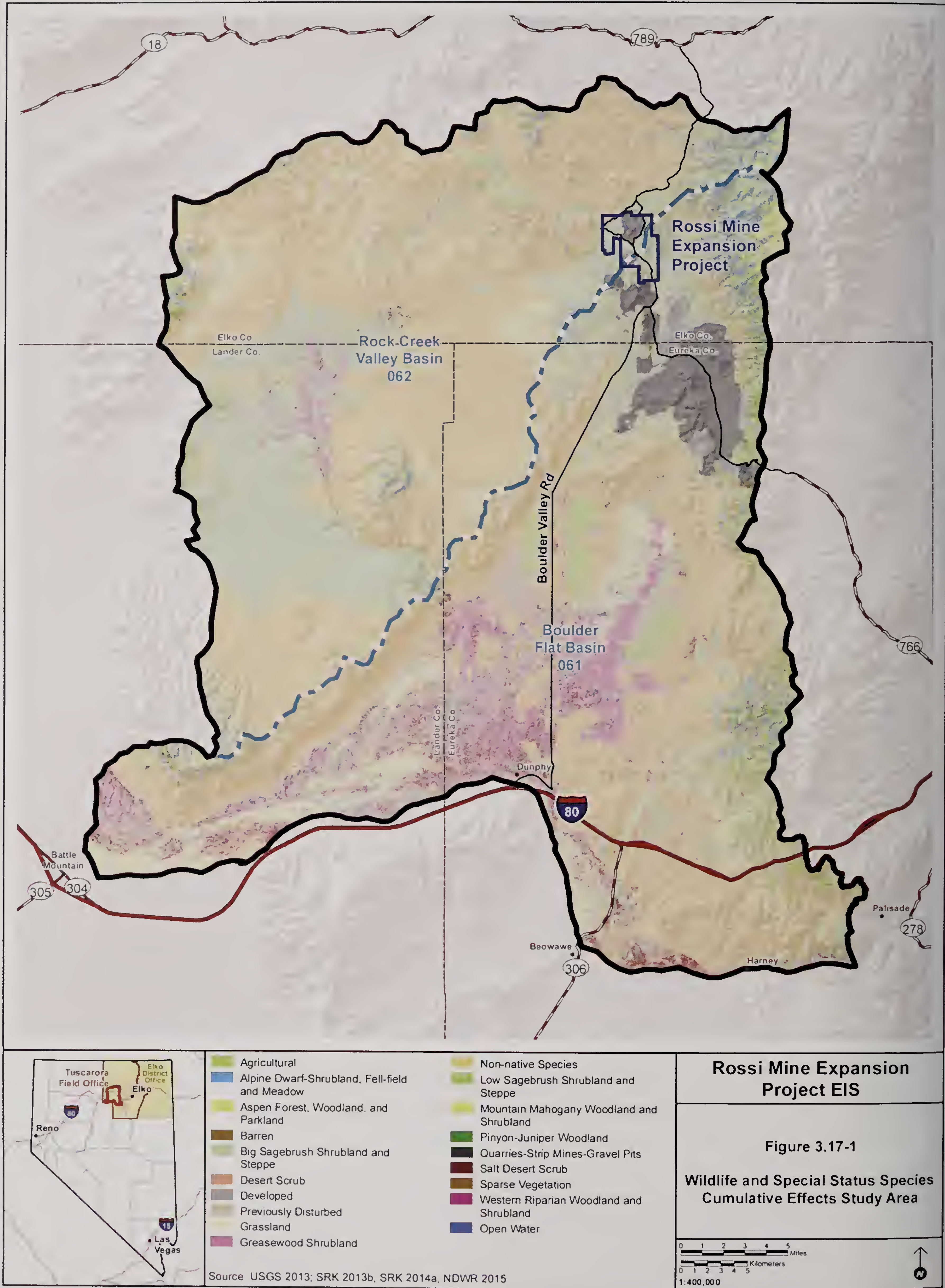
Wildlife species and habitats found within the study area are typical of the Central and Northern Basin and Range Ecoregions (Bryce et al. 2003). Available water for wildlife consumption is limited in the study area. Surface water features include unvegetated short-seasonal ponds, strips of moderately wet mesic meadows, and perennial springs supporting wetland vegetation. Riparian-specific features include willow and herbaceous riparian habitats (EcoSynthesis 2013).

Information regarding wildlife species and habitat within the study area and CESAs was obtained from a review of existing published sources, site-specific wildlife and habitat surveys, and the BLM, NDOW, and USFWS file information.

3.17.1.2 Big Game Species

Big game species are managed by NDOW, with species specific range designations and migration corridors delineated across the entire state. Mule deer (*Odocoileus hemionus*), pronghorn (*Antilocapra americana*), and elk (*Cervus canadensis*) are the primary big game species within the study area (SRK 2013b; NDOW 2014). The study area occurs entirely within NDOW's Management Area 6, specifically hunting unit 068.

Mule deer, pronghorn, and elk population numbers fluctuate slightly from year-to-year based on habitat conditions. Limiting factors within the study area include water availability and the amount of suitable habitat. Seasonal use and movement patterns in the vicinity of the study area depend on weather and forage availability and quality.



Source USGS 2013; SRK 2013b, SRK 2014a, NDWR 2015

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Figure 3.17-1

Wildlife and Special Status Species Cumulative Effects Study Area

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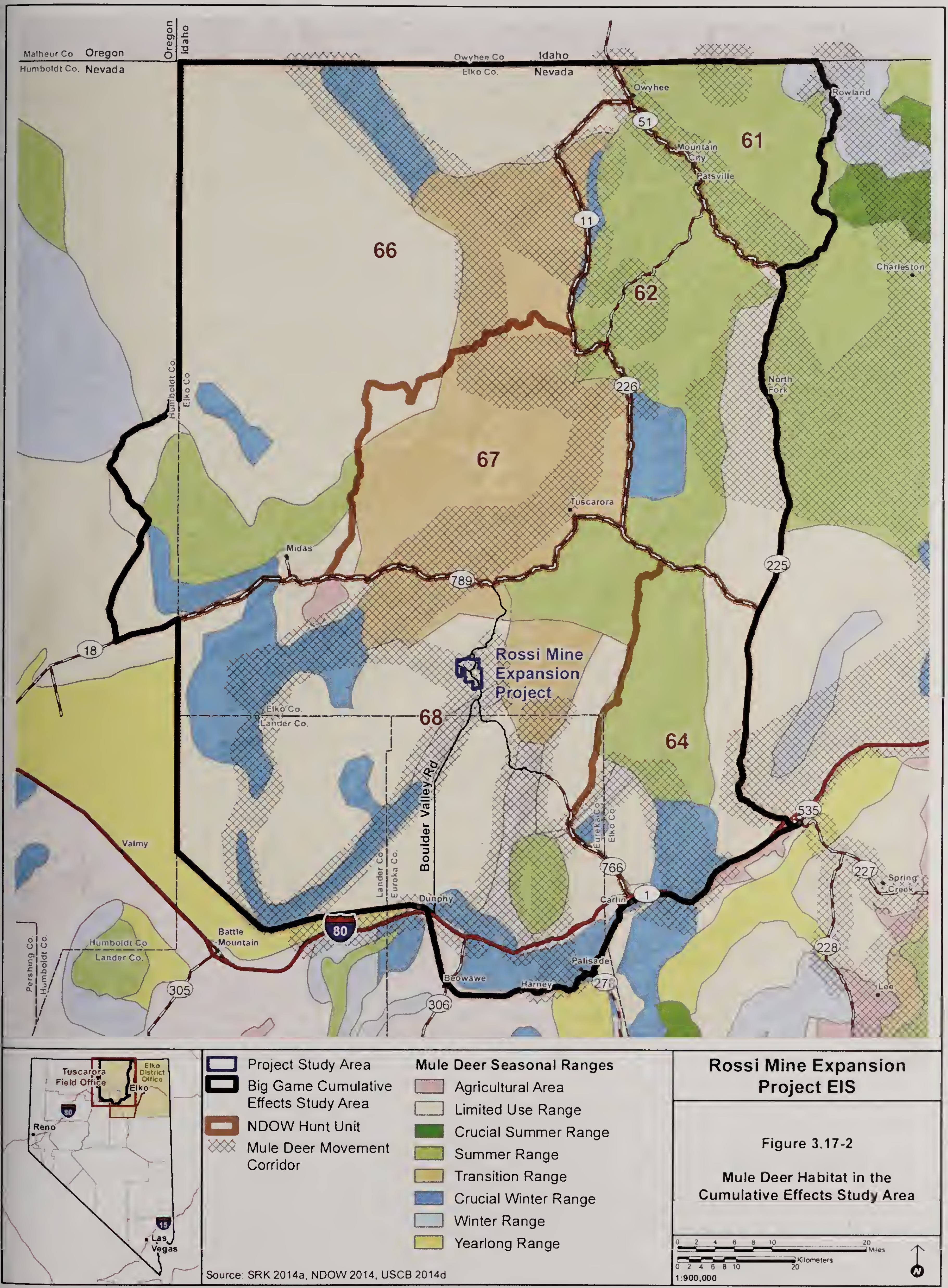

Figure 3.17-2

Mule Deer Habitat in the Cumulative Effects Study Area

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Mule Deer

The population numbers for mule deer have been stable in Management Area 6 for the past couple of years. A total of 6,495 deer were classified during a helicopter survey conducted in December 2016 and is the largest sample ever observed since 1992 (NDOW 2017c). An abbreviated spring helicopter survey was conducted in April 2016, with a total of 2,990 deer classified yielding a ratio of 28 fawns: 100 adults. This observed fawn ratio indicated a 50% overwinter fawn loss. This percentage of loss is reflective of early season snow, above average winter snowpack and the continued loss of transitional habitat and winter range over the last decade.

This mule deer herd can increase rapidly due to high quality summer habitat and associated high numbers of fawns; however, poor winter range conditions in Area 6 can dictate long-term population levels which have occurred since the 1960s (NDOW 2015b).

Big game species including mule deer require tags from NDOW to be hunted. The number of mule deer tags issued reflects the previous year's population and number of mule deer that can be safely taken by hunting activities without adversely affecting the total population of the herd. **Table 3.17-1** below shows the compiled mule deer tag numbers for Management Area 6 (excluding Unit 065) from 2010 through 2015. There were a total of 2,926 tags issued for mule deer in 2015 in Management Area 6. The average number of tags for the past 5 years is approximately 2,402. Long-term Management Area 6 population trends indicate a steady decline of mule deer since monitoring began in the 1950s (MDWGC 2012).

Table 3.17-1. Management Area 6 Mule Deer Tags Issued by NDOW between 2010 and 2015

Year	Mule Deer Tags Issued
2010	1318
2011	1147
2012	3194
2013	2747
2014	3079
2015	2926

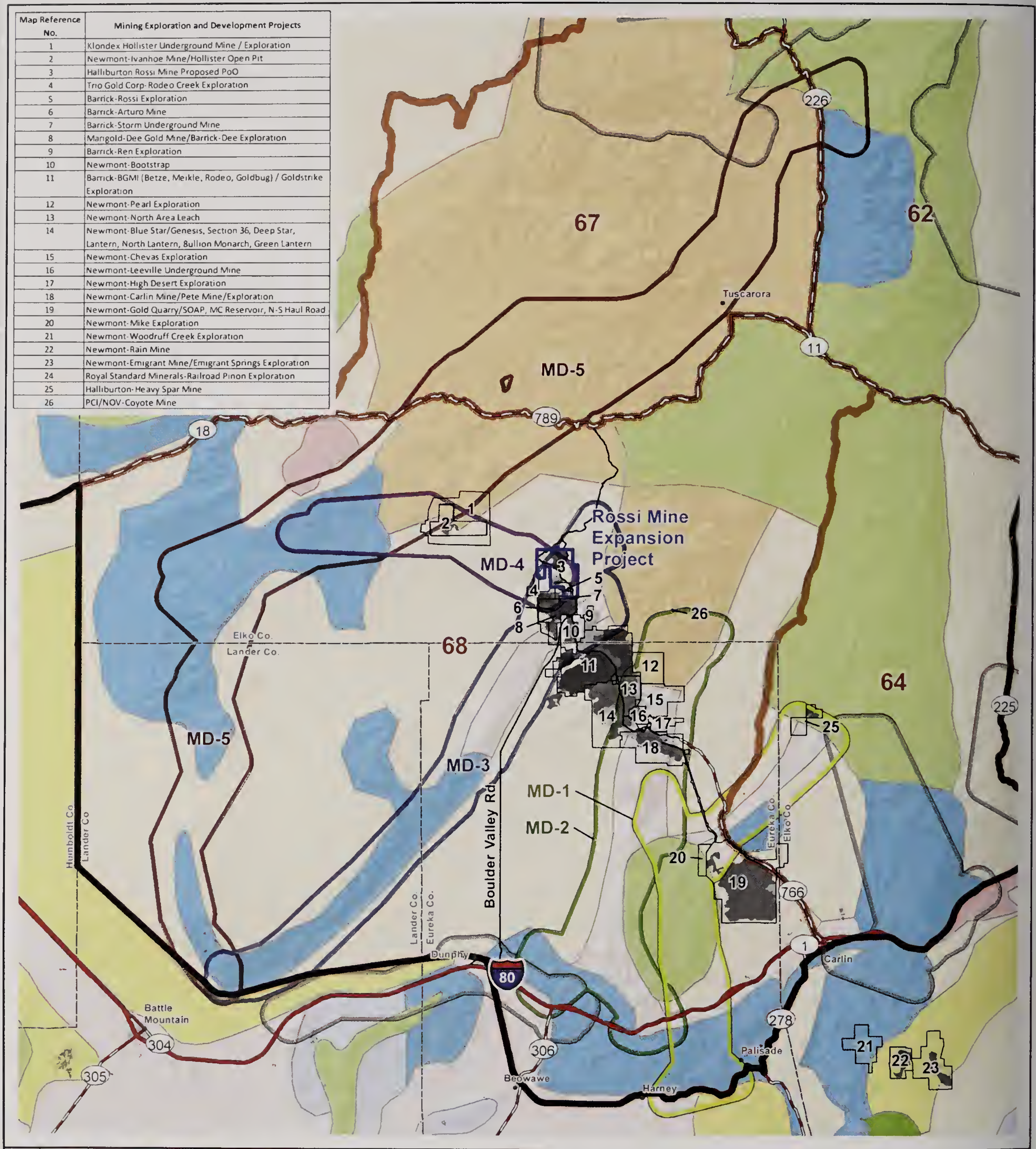
Source: NDOW 2016a.

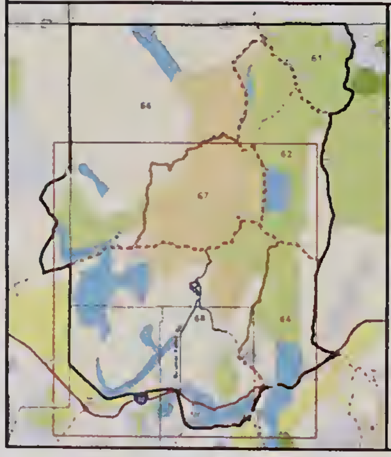
Mule deer use of the study area is variable; the majority of the mule deer in the study area and surrounding vicinity typically spend the summer months in the Tuscarora Mountains and Independence Range, north of the study area, and winter near the Dunphy Hills, Sheep Creek Range, and Izzenhood Range areas, south of the study area (BLM 2010b, BLM 2010c, BLM 2008a). The study area is entirely comprised of mule deer limited use habitat, which may be used by mule deer throughout the year depending on forage availability and conditions (**Figure 3.17-2**).

The study area is geographically located between important mule deer summer and winter range and supports seasonal migration of mule deer between these ranges as shown in **Figure 3.17-3**. A total of five separate migration corridors that cross the Carlin Trend area have been identified through surveys of mule deer seasonal movement and telemetry collaring studies previously conducted by NDOW and the BLM (**Figure 3.17-3**). The entire project study area is classified as a mule deer movement corridor which is primarily used by mule deer but may also be used by pronghorn and elk depending on weather patterns and snow conditions. A wildlife movement corridor is defined as a linear habitat with a primary function of connecting at least two significant habitat areas (Sawyer et al. 2005). A large herd of mule deer migrates south from its summer range in the Tuscarora Mountains, Independence Range, and Bull Run Mountains to winter range in the lower elevations of Boulder Valley and the Dunphy Hills (BLM 2010b, BLM 2010c, BLM 2008a). Recent and historic wildfires have burned approximately 1.5 million acres of rangeland in Area 6 which have changed the vegetation composition and allowed

invasive cheatgrass (*Bromus tectorum*) to spread throughout mule deer range. Habitat changes and cheatgrass invasion of vegetation communities in combination with the significant expansion of Carlin Trend mining developments along the east side of the Tuscarora Range have limited remaining unimpeded north/south big game movement as presented in **Figure 3.17-3** (NDOW 2014, BLM 2008a).

Map Reference No.	Mining Exploration and Development Projects
1	Klondex Hollister Underground Mine / Exploration
2	Newmont-Ivanhoe Mine/Hollister Open Pit
3	Halliburton Rossi Mine Proposed PoO
4	Trio Gold Corp-Rodeo Creek Exploration
5	Barrick-Rossi Exploration
6	Barrick-Arturo Mine
7	Barrick-Storm Underground Mine
8	Marigold-Dee Gold Mine/Barrick-Dee Exploration
9	Barrick-Ren Exploration
10	Newmont-Bootstrap
11	Barrick-BGMI (Betze, Meikle, Rodeo, Goldbug) / Goldstrike Exploration
12	Newmont-Pearl Exploration
13	Newmont-North Area Leach
14	Newmont-Blue Star/Genesis, Section 36, Deep Star, Lantern, North Lantern, Bullion Monarch, Green Lantern
15	Newmont-Chevas Exploration
16	Newmont-Leeville Underground Mine
17	Newmont-High Desert Exploration
18	Newmont-Carlin Mine/Pete Mine/Exploration
19	Newmont-Gold Quarry/SOAP, MC Reservoir, N-S Haul Road
20	Newmont-Mike Exploration
21	Newmont-Woodruff Creek Exploration
22	Newmont-Rain Mine
23	Newmont-Emigrant Mine/Emigrant Springs Exploration
24	Royal Standard Minerals-Railroad Pinon Exploration
25	Halliburton-Heavy Spar Mine
26	PCI/NOV-Coyote Mine





Project Study Area
Big Game CESA
Mine Plan Boundaries
Quarries-Strip Mines-Gravel Pits
Developed/Disturbed Areas

Mule Deer Corridor Groups

MD-1
MD-2
MD-3
MD-4
MD-5
Other Corridor

NDOW Hunt Unit

Mule Deer Seasonal Ranges

Agricultural Area
Limited Use Range
Crucial Summer Range
Summer Range
Transition Range
Crucial Winter Range
Winter Range
Yearlong Range

Source: BLM 2010b, SRK 2014a, NDOW 2014, USCB 2014d

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Figure 3.17-3

Mule Deer Migration Corridors and Seasonal Ranges within the Carlin Trend Area

0 1 2 3 4 5 10 Miles
0 1 2 3 4 5 10 Kilometers
1:600,000

10/12/2017

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Pronghorn

Similar to mule deer, pronghorn have been affected by wildfires and the loss of vital sagebrush communities in recent years. Pronghorn numbers have been stable to increasing in Units 067-068 over the past several years. NDOW ground surveys classified 822 pronghorn during February 2017 surveys (NDOW 2017c). The entire study area is designated as pronghorn summer range. Pronghorn crucial winter range occurs approximately five miles south of the study area along the north edge of the Boulder Valley (**Figure 3.17-4**).

Elk

The population of elk in Units 062, 064, 066-068 has been observed to be somewhat stable over the past 5 years with some minor fluctuations. Elk populations were observed to have increased by an average of 14 percent annually between 2003 and 2012; however, the growth of this herd has declined since 2013 by approximately 12 percent (NDOW 2015b). Aerial surveys in January 2017 resulted in the classification of 457 elk. The majority of the study area is considered to be low-density habitat for elk by NDOW. There are approximately 3,598 acres (96 percent of the study area) of elk limited use range and 144 acres (4 percent of the study area) of elk crucial winter range located within the study area (**Figure 3.17-5**).

Mountain Lion

NDOW also classifies mountain lion as a big game species. Mountain lion habitat is considered to be in good condition throughout the Eastern Region and population trends are stable averaging approximately 17 individuals harvested in the 061-068 Units from 2009 to 2015 based on NDOW harvest data (NDOW 2015b).

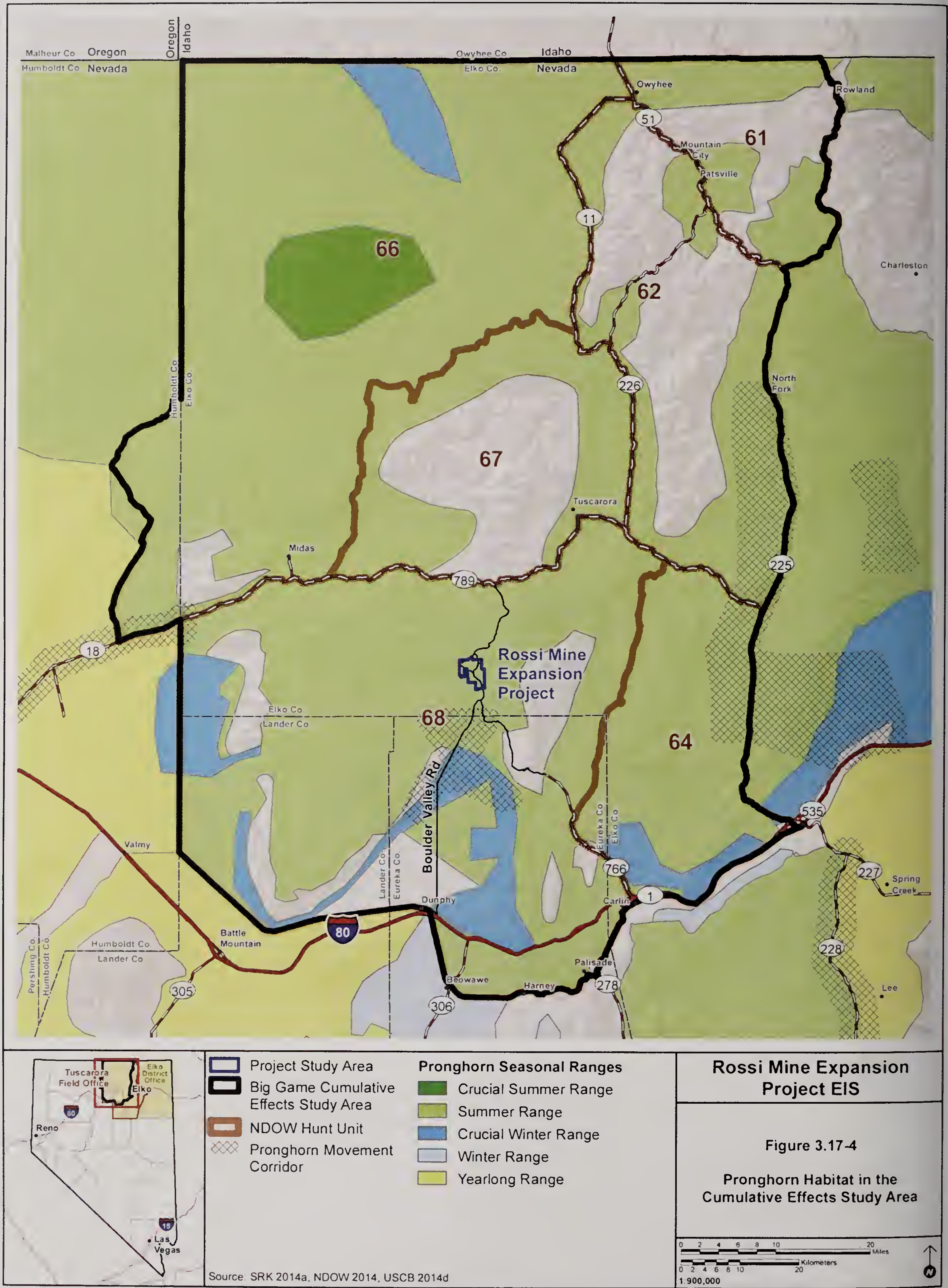
3.17.1.3 Small Game Species

Several upland game bird species are found within the study area. Species that have been documented within the study area include mourning dove (*Zenaida macroura*) and chukar (*Alectoris chukar*). Mourning doves are found in a wide range of habitats in close proximity to water and are most likely to occur within the study area during spring, summer, and early fall (Wildlife Action Plan Team 2012). A mourning dove nest was observed in late May in the study area (SRK 2013b). Chukar occur in hills, rocky ridges, and hillsides. Two different pairs of chukar and nests were observed in the study area on the mid-elevations of the east-facing slope in Section 22 (SRK 2013b). The greater sage-grouse (*Centrocercus urophasianus*) is listed as a BLM sensitive species and is discussed in detail in Section 3.18, Special Status Species.

Four rabbit species have the potential to occur in the study area. The desert cottontail (*Sylvilagus audubonii*) and black-tailed jackrabbit (*Lepus californicus*) were observed during wildlife surveys conducted in the study area. The white-tailed jackrabbit (*Lepus townsendii*) has also been observed within the project area. The pygmy rabbit (*Brachylagus idahoensis*) is listed as a BLM sensitive species and is discussed in Section 3.18, Special Status Species.

The NAC 503.025 classifies several mammal species as furbearers. Furbearer species that may occur within the study area include gray fox, kit fox, bobcat, muskrat, and mink (NDOW 2014). Furbearing species are unlikely to occur in the study area due to the lack of riparian habitat and associated vegetative structural diversity that typically supports these species. Other mammal species that may occur within the study area include badger (*Taxidea taxus*), coyote (*Canis latrans*), gopher (*Thomomys* spp.), kangaroo rat (*Dipodomys* spp.), Townsend's ground squirrel (*Spermophilus townsendii*), and vole (*Microtus* spp.) (SRK 2013b).

Limited areas of wetland habitat for waterfowl populations occur in the study area. Species that have been observed within the study area include Canada goose (*Branta candensis*), cinnamon teal (*Anas cyanoptera*), mallard (*Anas platyrhychos*), and redhead (*Aythya americana*) (SRK 2013b).



Rossi Mine Expansion Project EIS

Figure 3.17-4

Pronghorn Habitat in the Cumulative Effects Study Area

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notice.

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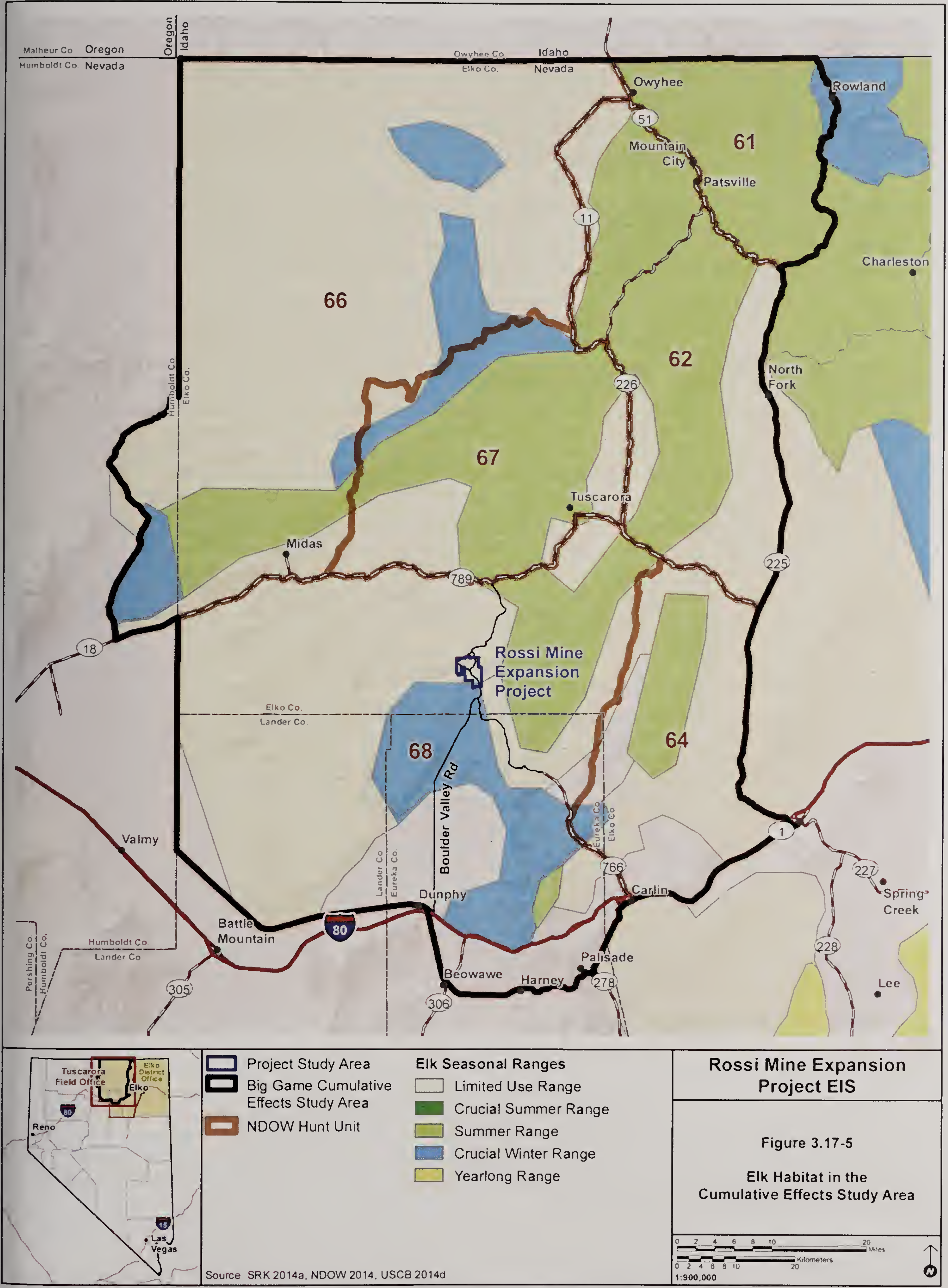


Figure 3.17-5

Elk Habitat in the Cumulative Effects Study Area

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notice.

3.17.1.4 Nongame Species

A diversity of nongame species (e.g., small mammals, migratory birds, raptors, reptiles, and amphibians) occupies the study area. Habitats within the study area (e.g., sagebrush shrubland and steppe, grassland) support both resident and seasonal nongame species.

Bats

A number of bat species are known to inhabit the project region. Detection surveys for bat species were conducted in May 2012 and July 2012 in the study area according to BLM recommendation. A total of four acoustic survey nights were conducted using six separate acoustic detectors located in areas of suitable roosting habitat (i.e., rock outcrops) and foraging habitat (i.e., wet drainages, stock ponds).

Detected bats include Brazilian free-tailed bat (*Tadarida brasiliensis*), California myotis (*Myotis californicus*), little brown bat (*Myotis lucifugus*), small-footed myotis (*Myotis ciliolabrum*), and Yuma myotis (*Myotis yumanensis*) (SRK 2013b). In addition to these bat species that were detected during acoustic surveys, suitable habitat for the big brown bat (*Eptesicus fuscus)*, fringed myotis (*Myotis thysanodes)*, hoary bat (*Lasiurus cinereus)*, long-eared myotis (*Myotis evotis)*, long-legged myotis (*Myotis volans)*, pallid bat (*Antrozous pallidus)*, silver-haired bat (*Lasionycteris noctivagans)*, Townsend's big-eared bat (*Corynorhinus townsendii*), western pipistrelle (*Parastrellus hesperus*), and the spotted bat (*Euderma maculatum*) occurs within the project area. All of these bat species are designated as BLM sensitive species (BLM 2015d). These species are discussed in further detail in Section 3.18, Special Status Species.

Roosting habitat is available in the study area and consists primarily of rock outcrops, the largest of which (approximately 30 feet high) are found in the western and central areas of the project area. Smaller rock outcrops (less than 30 feet high) are present west of and along the ridgelines in the eastern portion of the project area. The pits located in the study area are unlikely to be used by bats as maternity or hibernating colony locations as these are active mine sites with dirt walls and few to no crevices from which bats can grasp and hang (SRK 2013b).

Migratory Birds and Raptors

Nongame birds encompass a variety of avian species including migratory bird species that are protected under the Migratory Bird Treaty Act (MBTA) (16 United States Code 703–711) and Executive Order 13186 (66 FR 3853). Pursuant to Executive Order 13186, a MOU between the BLM and USFWS outlines a collaborative approach to promote the conservation of migratory bird populations. The purpose of the MOU is to strengthen migratory bird conservation by identifying and implementing strategies that promote conservation and avoid or minimize adverse impacts on migratory birds in coordination with state, tribal, and local governments. This MOU identifies specific activities where cooperation between the BLM and USFWS would contribute to the conservation of migratory birds and their habitat. In addition, the BLM Nevada State Office prepared Migratory Bird Applicant Committed Environmental Protection Measures for the Sagebrush Biome in order to assist BLM field offices in the consideration of migratory birds in land management activities (BLM 2003). In Nevada, all birds protected under the MBTA also are state protected (NAC 503.050). Many of the BLM sensitive migratory bird species found in Nevada also are identified in the Nevada Partners in Flight (PIF) Bird Conservation Plan (Neel 1999). This plan, along with the Birds of Conservation Concern (BCC) Plan (USFWS 2008), prioritizes migratory bird species for management actions according to habitat types.

Several baseline biological surveys were conducted within the study area in 2013 (SRK 2013b) during the breeding season months of April through July. Baseline surveys were not conducted during the winter months, therefore avian species that would be more likely to occur within the study area during the winter, including bald eagles and rough-legged hawks, were less likely to be observed during surveys. In total, 39 avian species were observed in the study area during baseline surveys and are presented in **Table 3.17-2** below. In addition to the species listed in **Table 3.17-2**, other avian species that occur in northern Nevada and could potentially occur within the project area are included in the NDOW publication Birds of Northeastern Nevada (NDOW 2015a).

Table 3.17-2. Migratory and Resident Bird Species Potentially Occurring within the Study Area

Common Name	Scientific Name	Status[1]	Observed in Study Area[2]
American avocet[3]	*Recurvirostra americana*		Yes
American coot[3]	*Fulica americana*		Yes
American robin	*Turdus migratorius*		Yes
Bald eagle	*Haliaeetus leucocephalus*	BLM, BCC	No
Black-billed magpie	*Pica hudsonia*		Yes
Black-chinned sparrow	*Spizella atrogularis*	BCC	No
Black rosy-finch	*Leucosticte atrata*	BLM, BCC, PIF	No
Black swift	*Cypseloides niger*	BCC	No
Black-throated sparrow	*Amphispiza bilineata*		Yes
Brewer’s blackbird	*Euphagus cyanocephalus*		Yes
Brewer’s sparrow	*Spizella breweri*	BLM, BCC	Yes
Brown-headed cowbird	*Molothrus ater*		Yes
Burrowing owl	*Athene cunicularia*	BLM, PIF	No
Calliope hummingbird	*Stellula calliope*	BCC, PIF	No
Canada goose[3]	*Branta canadensis*		Yes
Chukar	*Alectoris chukar*		Yes
Cinnamon teal[3]	*Anas cyanoptera*		Yes
Cliff swallow	*Petrochelidon pyrrhonota*		Yes
Common nighthawk	*Chordeiles minor*		Yes
Common poorwill	*Phalaenoptilus nuttallii*		Yes
Common raven	*Corvus corax*		Yes
Eared grebe	*Podiceps nigricollis*	BCC	No
Ferruginous hawk	*Buteo regalis*	BLM, BCC, PIF	No
Flammulated owl	*Otus flammeolus*	BCC	No
Golden eagle	*Aquila chrysaetos*	BLM	Yes
Gray flycatcher	*Empidonax wrightii*	PIF	No
Gray partridge	*Perdix perdix*		No
Greater sage-grouse	*Centrocercus urophasianus*	BLM, BCC, PIF	Yes
Green-tailed towhee	*Pipilo chlorurus*	BCC	No
Horned lark	*Eremophila alpestris*		Yes
House finch	*Carpodacus mexicanus*		Yes
Killdeer	*Charadrius vociferous*		Yes
Lark sparrow	*Chondestes grammacus*		Yes

Table 3.17-2. Migratory and Resident Bird Species Potentially Occurring within the Study Area

Common Name	Scientific Name	Status[1]	Observed in Study Area[2]
Lewis woodpecker	*Melanerpes lewis*	BLM, BCC	No
Loggerhead shrike	*Lanius ludovicianus*	BLM, BCC, PIF	Yes
Long-billed curlew	*Numenius americanus*	BCC	No
Mallard[3]	*Anas platyrhynchos*		Yes
Marbled godwit	*Limosa fedoa*	BCC	No
Mourning dove	*Zenaida macroura*		Yes
Mountain bluebird	*Sialia currucoides*		Yes
Northern goshawk	*Accipiter gentilis*	BLM	No
Northern harrier	*Circus cyaneus*		Yes
Peregrine falcon	*Falco peregrinus*	BLM, BCC	No
Pinyon jay	*Gymnorhinus cyanocephalus*	BLM, BCC	No
Prairie falcon	*Falco mexicanus*	PIF	Yes
Red-tailed hawk	*Buteo jamaicensis*		Yes
Red-winged blackbird	*Agelaius phoeniceus*		Yes
Redhead[3]	*Aythya americana*		Yes
Rock wren	*Salpinctes obsoletus*		Yes
Rough-legged hawk	*Buteo lagopus*		No
Sage sparrow	*Amphispiza belli*	BCC, PIF	Yes
Sage thrasher	*Oreoscoptes montanus*	BLM, PIF	Yes
Short-eared owl	*Asio flammeus*		No
Spotted sandpiper[3]	*Actitis macularia*		Yes
Spotted towhee	*Pipilo maculatus*		No
Swainson's hawk	*Buteo swainsoni*	BLM, PIF	No
Tricolored blackbird	*Agelaius tricolor*	BCC	No
Turkey vulture	*Cathartes aura*		Yes
Western kingbird	*Tyrannus verticalis*		Yes
Western meadowlark	*Sturnella neglecta*		Yes
Western snowy plover	*Charadrius nivosus*	BLM, BCC	No
White-headed woodpecker	*Picoides albolarvatus*	BCC	No
Williamson's sapsucker	*Sphyrapicus thyroideus*	BCC	No
Willow flycatcher	*Empidonax traillii*	BCC	No
Vesper sparrow	*Pooecetes gramineus*	PIF	Yes
Virginia's warbler	*Leiothlypis virginiae*	BCC	No

Table 3.17-2. Migratory and Resident Bird Species Potentially Occurring within the Study Area

Common Name	Scientific Name	Status[1]	Observed in Study Area[2]
Yellow-headed blackbird[3]	*Xanthocephalus*		Yes
Yellow rail	*Coturnicops noveboracensis*	BCC	No

Sources: BLM 2015a; SRK 2013b; USFWS 2008; Neel 1999.

[1] BLM = BLM Sensitive Species; BCC = USFWS Birds of Conservation Concern; PIF = Nevada Partners in Flight Priority Bird Species.
[2] Identified during baseline biological surveys in spring 2013.
[3] Recorded only at the stock pond.

Any of these species are associated with a variety of habitats; however, most avian species observed are associated with sagebrush and grassland habitats.

Raptor species that potentially occur as residents or migrants within the study area include eagles (golden and bald eagles), hawks (e.g., red-tailed hawk, ferruginous hawk, rough-legged hawk, and Swanson's hawk), falcons (e.g., prairie falcon, American kestrel), northern harrier, and turkey vulture (SRK 2013b). Thirty-one golden eagle nest sites were identified and monitored within a 10-mile radius around the study area; seven of these nests were active and 24 nests were inactive. Nest sites were attributed as golden eagle sites either through confirmation of golden eagle activity at the site or by site specific characteristics common to golden eagle nests. Golden eagles commonly nest in large stick nests located upon cliff faces and can reuse nest sites for several years (Floyd et al. 2007). Golden eagles are protected under the Bald and Golden Eagle Protection Act (BGEPA) and are discussed in Section 3.18, Special Status Species. Field surveys within the 10-mile buffer of the PoO boundary also identified nine active red-tailed hawk nests, one active ferruginous hawk nest, and two active prairie falcon nests. No raptor nests have been found within the PoO boundary; four active nests were observed within one mile of the PoO boundary in 2015 (Stantec 2015).

Details on bird species designated as BLM Sensitive Species including Brewer's sparrow, greater sage-grouse, loggerhead shrike, and sage thrasher are discussed further in Section 3.18, Special Status Species.

Reptiles

Several species of reptiles and amphibians were observed in the project area during baseline wildlife surveys. Reptiles that were detected include desert horned lizard (*Phrynosoma platyrhinos*), Great Basin gopher snake (*Pituophis catenifer*), sagebrush lizard (*Sceloporus gracious*), side-blotched lizard (*Uta stansbuiriana*), striped whipsnake (*Masticophis taeniatus*), and western fence lizard (*Sceloporus occidentalis*) (SRK 2013b). These species occupy a wide variety of habitats and are most active during the summer and early fall months (BLM 2008a).

3.17.1.5 Aquatic Biological Resources

Riparian Habitat

Riparian habitat is minimal within the study area and is limited primarily to areas adjacent to constructed ponds and wetlands. Narrow patches of riparian willow habitat are found around small portions of the perimeter of the large perennial pond (feature W-2, **Figure 3.14-4**) located to the south of the jig plant processing area. Another area of riparian willow habitat occurs along a roadside drainage ditch to the east of this perennial pond. Vegetation in these areas is dominated by coyote willow (*Salix exigua*) and willow herb (*Epilobium ciliatrum*) (EcoSynthesis 2013).

Riparian herbaceous habitat occurs in areas that exhibit consistent surface water flows including areas south of the Queen Lode Complex, and north of the King North WRDF (**Figure 3.4-4**). These areas were dominated by coyote willow, Baltic rush (*Juncus balticus*), meadow barley (*Hordeum brachyantherum*), Nebraska sedge (*Carex nebrascensis*), American speedwell (*Veronica americana*), and rabbitsfoot grass (*Polypogon monspeliensis*) (EcoSynthesis 2013).

Wetlands

Two small perennial ponds occur at the south end of the jig plant processing area. These ponds (W-2 and W-3, **Figure 3.14-4**) are artificial features created by excavation and/or construction of an earthen berm. There is wide fluctuation in water level in these wetlands and they likely are not biologically functional ponds; however, the water level is deep enough to support wetland vegetation including patches of cattail and coyote willow (EcoSynthesis 2013).

Numerous small seasonal ponds are scattered throughout the study area, all of which are created by humans. These ponds are inundated during the spring and/or summer and are generally unvegetated or sparsely vegetated. Vegetation of the ponds is variable depending on the duration of inundation. The most common and consistently present plant species are sand knotweed (*Polygonum aviculare*), annual hairgrass (*Deschampsia danthonioides*), and meadow barley (*Hordeum brachyantherum*). The driest of the ponds also support small amounts of upland weeds such as cheatgrass (*Bromus tectorum*), tumble mustard (*Sisymbrium altissimum*), and poverty weed (*Iva axillaris*) (EcoSynthesis 2013).

Aquatic Communities

Due to a lack of high volume perennial flows from spring features SP-001 and SP-002 and an existing connection to perennial water bodies (**Figure 3.14-4**), it is unlikely that wetlands or riparian habitats within the study area support fish species. These areas may support amphibian species. An adult pacific tree frog was observed in late April in a rock outcrop in the northern portion of the study area; however no known water was present within a quarter-mile of the observation. Pacific treefrogs were heard chorusing at night in a drainage approximately one mile northwest of the study area (SRK 2013b).

3.17.2 Environmental Consequences

Terrestrial and aquatic biological resources related issues were determined through consultation with the BLM, NDOW, and USFWS. The primary issues related to terrestrial wildlife include loss or alteration of native habitats; increased habitat fragmentation; individual and population displacement; and direct mortality or injury of wildlife. The primary issues for aquatic biological resources include habitat alteration and the impacts of sedimentation and increased salinity on aquatic species due to surface disturbance activities; and potential spills from vehicle traffic and equipment during construction and operation phases of the project.

The potential impacts of the proposed project on terrestrial wildlife and aquatic biological resources can be classified as short-term (temporary) and long-term in duration. Short-term impacts result from habitat disturbance and removal due to construction and from activities associated with mine operation and occur during the active life of the mine and until reclamation is successfully completed. Short term impacts would cease upon mine closure and completion of successful reclamation. Long-term impacts include permanent changes to habitats and the wildlife and aquatic populations that depend on those habitats, regardless of reclamation success.

3.17.2.1 Proposed Action

Wildlife Resources

<u>*Surface Disturbance*</u>

Under the Proposed Action approximately 1,167 acres of new short-term surface disturbance would result from mining activity. This proposed surface disturbance, in addition to the 896 acres of previously authorized disturbance would result in a total of approximately 2,063 acres.

Disturbance associated with the Proposed Action would be reclaimed, with the exception of 194 acres of expanded and new open pits that would not be backfilled and reclaimed. Approximately 53 acres of Mixed Mountain and Low Sagebrush, 23 acres of Mixed Black, Wyoming and Mountain Sagebrush, 16 acres of annual grasslands, 6 acres of Mixed Wyoming and Mountain Sagebrush, one acre of meadow habitat, and 95 acres of previously disturbed lands would be permanently unavailable to wildlife species.

Direct impacts to wildlife from mine-related surface disturbance would include short-term and long-term reduction or loss of habitat. Habitat loss or alteration would result in direct losses of smaller, less mobile species of wildlife, such as small mammals and reptiles, and the displacement of more mobile species into adjacent habitats. In areas where habitats are densely populated, animal displacement could result in some unquantifiable reductions in local wildlife populations. Mine-related surface disturbance would also result in incremental increase in habitat fragmentation at the mine site until reclamation is completed and vegetation re-established. Indirect impacts would include increased noise, increased human presence, especially during the construction phase, and the potential for increased vehicle-related mortalities. The degree of the impacts on wildlife species would depend on factors such as the sensitivity of the species, seasonal use patterns, type and timing of project activity, and physical parameters (e.g., topography, cover, forage, and climate).

Exploration activities within the project area would also impact wildlife species and approximately 67 acres of suitable habitat. Impacts from exploration would include surface disturbance resulting from construction of exploration roads, drill pads, and other exploration infrastructure as described in Section 2.3.10, Exploration. Indirect impacts resulting from exploration activities would include increased human presence and noise during road and pad construction and active drilling operations. Active exploratory drilling could occur over a 24 hour period; therefore, additional impacts resulting from artificial lighting may occur to wildlife species such as displacement, disorientation, and interruption of roosting and resting individuals. Exploration activity would also result in increased fugitive dust and short-term habitat fragmentation. Exploration activities within the project area are not subject to seasonal timing restrictions for mule deer migration areas and other sensitive habitat. Exploration activities may result in an increase of human presence and noise during sensitive periods. Although exploration activities may be occurring in the migration corridor and dependent upon weather conditions occurring at the time of the migration, mule deer would continue to either move rapidly or slowly through or around the area.

Reclamation of mining disturbance and removal of mining support and ancillary facilities would occur as presented in Section 2.3.12, Closure and Reclamation Plan. Impacts of reclamation and removal of mining facilities would be similar to impacts resulting from mine construction and operation, including the presence of vehicles, equipment, and reclamation staff within the PoO boundary. During reclamation, increased dust, vibration, and noise would result in increased temporary disturbance in the areas where reclamation is actively being implemented. Periodic monitoring of reclamation success would result in the presence of reclamation staff, vehicles, and equipment within the PoO boundary.

Game Species

As indicated in Section 3.17.1.2, Big Game Species, big game species including mule deer, pronghorn, and elk have been documented in the study area. Big game may experience higher levels of mortality due to the construction of new roads under the Proposed Action which would result in 42 acres of new surface disturbance, and associated increased vehicular traffic during construction, expansion, and development. Although records of collisions involving Rossi Mine vehicles and wildlife indicate a low probability of mortality, vehicular traffic collisions may injure or kill individual big game species, and local populations may experience higher levels of mortality due to an increased number of roads and use of existing roads in the immediate project vicinity. Big game may also experience mortality due to increased vehicular traffic and construction equipment.

Additional direct impacts to all big game species include the incremental long-term reduction of potential forage and the incremental increase in habitat fragmentation from vegetation removal associated with mine development activities. Development of the Proposed Action would also decrease the quality of suitable big game habitat resulting from changes in floral species composition and/or an increase in invasive species during the development phase. Direct habitat loss and indirect reduction in habitat quality would result in displacement of big game. Displacement of big game would be most significant adjacent to heavily traveled roads because roads are often open to unregulated use. Mule deer,

pronghorn, and elk may decrease habitat use in suitable habitat adjacent to roads within the study area and could result in big game species traveling farther to meet their nutritional and energy needs (Sawyer et al. 2009, Sawyer et al. 2005, Rost and Bailey 1979). These impacts would also affect recreation opportunities for local big game hunting within the area of the Rossi Mine. Discussion of impacts to hunting opportunity is presented in Section 3.11, Recreation and Wilderness.

The Proposed Action would disturb approximately 1,167 acres of mule deer limited use range and movement corridor consisting primarily of sagebrush shrubland and steppe habitat. Approximately 973 acres of mule deer limited use habitat would be reclaimed and considered short-term disturbance while 194 acres would be permanent surface disturbance (**Figure 2-4**). This anticipated loss of habitat would result in an incremental reduction in the amount of available habitat for mule deer in the study area. Discussion of cumulative impacts to mule deer migration from past, present, and future projects within the Carlin Trend area is presented in Section 3.17.3, Cumulative Impacts. The reduction of available habitat would result in the increase in use of disturbed areas by mule deer during migration. This could lead migrating mule deer to increase their rate of movement when they encounter infrastructure and human disturbance (Sawyer and Brittell 2014). Mule deer may also experience increased overall migration time by navigating a greater amount of obstacles, resulting in less efficient and longer movement pathways (Blum et al. 2015). These behavioral changes during migration may affect the timing of migration, lost foraging opportunities, and increased output in energy which could adversely affect mule deer (Sawyer and Brittell 2014).

Under the Proposed Action, HES would sequence the construction of the Queen West WRDF, Queen Lode WRDF, and Dawn WRDF to provide mule deer access to migration corridors for the greatest possible amount of time before placing waste rock within the corridor (SRK 2014a). HES is limited in its ability to maintain a 3,280 foot-wide migration corridor by the locations of mineral deposits within the PoO boundary, the technical and economic feasibility aspects of ore and waste rock handling procedures, and mineral entry to the south of the Rossi Mine by the previously authorized Arturo Mine. In addition, portions of the QLC North and QLC East WRDFs would be regraded, providing a 2,000-foot corridor before construction of the Dawn WRDF begins if exploration drilling expands the QLC pit. NDOW recommends that mule deer migratory corridor widths consist of a minimum of one km (approximately 3,280 feet) (NDOW 2012a). These measures would reduce adverse effects on mule deer and mule deer migration. However, mule deer would continue to travel rapidly or slowly either through or maneuver around the mining activity. The Rossi Mine Expansion Project may have a significant impact on the mule deer migration routes in the vicinity of the mine until the mine is successfully reclaimed.

Impacts to pronghorn would be similar to those discussed above for mule deer. Potential direct impacts would include the temporary reduction of 973 acres and long-term reduction of approximately 194 acres of summer range. Potential direct impacts to elk limited use habitat would include the temporary disturbance of 973 acres and long-term reduction of approximately 194 acres within the study area; while there would be 60 acres of temporary surface disturbance in crucial winter range and no long-term surface disturbance in crucial winter range for elk. Unlike mule deer and pronghorn, elk prefer to forage on grasses rather than sagebrush. The Proposed Action would result in the temporary conversion of approximately 823 acres of sagebrush habitat to grassland habitat during the early stages of reclamation activities, which would favor elk and may lead to short-term population increases and expansion into previously unoccupied habitat. Impacts to mountain lions are expected to be low, as this species occurs in low densities in and around the study area.

Direct impacts to small game species (e.g., mourning dove and chukar) would include the short-term reduction of 973 acres and long-term reduction of 194 acres of potentially suitable habitat. Potential impacts would also include displacement from the disturbance areas and increased habitat fragmentation until reclamation has been completed and vegetation is successfully re-established. In most instances, suitable habitat adjacent to disturbed areas would be available for use by these species which utilize smaller habitat areas for life history requirements than big game species. Potential impacts to small game from the Proposed Action are expected to be low.

Nongame Species

Impacts to nongame species would be similar to those described above for small game species. Direct impacts to nongame species (e.g., small mammals, migratory birds, raptors, reptiles, and amphibians)

would include the short-term reduction of 973 acres and the long-term reduction of 194 acres of potentially suitable habitat. Additional impacts specific to migratory birds and raptors are described below.

Impacts would also include displacement from the disturbed areas and increased habitat fragmentation until vegetation is re-established. In most instances, suitable habitat adjacent to disturbed areas would be available for use by these species; however, displacement would increase competition and could result in some local reductions in wildlife populations if adjacent habitats have a higher density of nongame species.

Direct mortality and injury due to vehicle collisions would be similar for small mammals as for big game species. Indirect impacts on mammal species would also be similar to those described for big game, with the exception of impacts to seasonal habitats and migratory corridors which are not delineated for other mammal species in the study area. Habitat fragmentation would have a greater impact on small mammals where roads and other disturbed areas lacking vegetation would present a formidable barrier to movement due to lack of cover and vulnerability to predation. Potential impacts to nongame species from mine development are expected to be low.

Direct impacts on amphibian and reptile species would be similar to those described for small mammals. Mortalities due to vehicular collisions would likely be higher for reptiles than for amphibians, because reptiles spend more of their life cycles in terrestrial systems, as opposed to aquatic systems. Amphibians may be prevented from moving through disturbed upland habitats located between the limited amounts of aquatic habitat in the study area. As a result, genetic exchange between local populations could decrease local populations.

Migratory Birds and Raptors

As described in Section 3.17.1.4, Nongame Species, a variety of resident and migratory bird species (e.g., raptors and songbirds) have been identified as potentially occurring within the study area. Potential direct impacts to bird species would include the short-term reduction of 973 acres and long-term reduction of 194 acres of potentially suitable breeding, roosting, and foraging habitat. Raptor mortalities could increase under the Proposed Action due to vehicular collisions similar to big game species. All new proposed power distribution lines would be buried effectively eliminating any increases to potential impacts to migratory birds and raptors. The Proposed Action would result in decreased quality of habitat for raptor prey species due to changes in vegetation community composition and/or an increase in invasive species during mine development, which would result in reduced prey availability.

Impacts to other migratory bird species would be similar to those described for raptors excluding the impacts on prey availability and predation which are not applicable to other birds that do not prey on small mammals. Impacts for migratory birds and raptors are expected to have little effect on local bird populations based on the amount of suitable breeding and foraging habitat in the area surrounding the study area which would not be affected by the Proposed Action.

HES would attempt to conduct surface disturbing activities outside the avian breeding season to prevent the destruction of active bird nests or of young birds during the avian breeding season for sagebrush-grassland habitats (March 1 – July 31). Surveys for active nests within areas to be cleared of vegetation would be conducted by a qualified biologist if it becomes necessary to clear land during the breeding season. HES's proposed construction, operation, and reclamation procedures would incorporate measures to protect eagles. Surveys would be conducted prior to ground disturbance during the breeding and nesting seasons (March 1 – July 31) to determine the presence or absence of eagles as well as other raptor species. HES would avoid areas by using a buffer zone developed in coordination with the BLM and NDOW if nesting or brooding eagles are determined to be present. See Section 2.3.13, Applicant Committed Environmental Protection Measures, for more information about protective measures for nesting migratory birds including raptors.

Human Presence and Noise

The main noise generating activities under the Proposed Action would include the expanded existing pits, the new Dawn Pit, WRDFs, and the ore processing site. Ore crushing under the Proposed Action would continue as currently conducted under existing authorizations so the noise from the processing site is not expected to increase relative to existing operations. Noise emissions from surface exploration activities

would be generated by heavy equipment constructing drill sites, operating drill rigs, and drilling support equipment. Mine traffic traveling on on-site haul roads and the Boulder Valley Road would be an additional source of noise as well.

The most common wildlife responses to noise and human presence are avoidance or accommodation. Avoidance would result in displacement of animals from an area larger than the actual disturbance acreage footprint. The total extent of habitat loss as a result of wildlife avoidance response cannot be predicted because the degree of this response varies between different species and can also vary between individuals of the same species. After initial avoidance of human activity and noise-generating areas, some wildlife species may acclimate to the activities and begin to reoccupy areas formerly avoided. For example, during the initial development phases, it is likely that big game (i.e., pronghorn and mule deer) would be displaced from a larger area than the actual disturbed sites due to the avoidance response (Sawyer et al. 2009, Sawyer et al. 2005, Rost and Bailey 1979); however, these big game species have demonstrated an ability to acclimate to a variety of activities as long as human harassment levels do not increase substantially. Studies have demonstrated a robust habituation response of ungulates to increased human activity (Stankowich 2008). Therefore, it is possible that the extent of displacement would decrease after the first few years of mine operation (Ward 1976). Potential impacts could also include nest abandonment or the loss of eggs or young for raptors and migratory bird species. Impacts of noise upon greater sage-grouse are presented in Section 3.18, Special Status Species.

The proposed project is in the Bootstrap Mining District which has experienced consistent mining activities over the past 100 years. Therefore, the immediate vicinity around the study area has sustained human activity associated with mining for many years which would minimize the potential impacts related to increased human presence and noise in the study area. The Rossi Mine has been in operation since 1947.

Water Quality and Quantity

Wildlife populations within the study area could be affected by exposure to accumulations of water that may be present in ditches and ponds within the study area. Species likely affected by changes to water quantity or quality include big game, upland game birds and small game animals, nongame birds (e.g., migratory birds and raptors), nongame mammals, reptiles, and amphibians. HES may remove accumulations of water collected in open pits from meteoric precipitation. HES may also erect temporary fencing around new pits and ponds to prevent access and injury to wildlife in coordination with the BLM and NDOW.

As discussed in Section 3.4.1.2, Proposed Action, groundwater data suggest that there is a potential for groundwater to be intercepted in the proposed expansion of the King Pit and QLC Pit resulting in the formation of a pit lake. Based on the available data, and recognizing that the water levels in the area of the west lobe of the King Pit are uncertain, there may be potential for groundwater flow to be encountered in the west lobe of the King Pit. Depending on the inflow rates, groundwater inflows combined with runoff from pit walls and direct precipitation there may be sufficient flow for development of pit lakes in the west lobe of the King Pit and the QLC Pit. If pit lakes were to develop as a result of mining activity under the Proposed Action, the potential for adverse effect to wildlife species may occur. Areas of open water occur infrequently in the project area and it is likely that wildlife could attempt to utilize pit lake areas for drinking, thermal regulation, or other uses. Potential monitoring and mitigation measures for water resources discussed in Section 3.4.4, Potential Monitoring and Mitigation Measures, present a set of measures for monitoring of the potential for pit lakes to develop, evaluation of water quality of pit lakes that may occur, and mitigation measures to reduce or eliminate adverse effects to terrestrial and avian wildlife species. Specific mitigation measures that could be implemented to eliminate or reduce the potential for wildlife species to be adversely affected could include 1) reduction in the depth of open pit mining or partial pit backfilling to preclude pit lake development; 2) utilizing treatment options such as adding amendments to modify pit lake water quality concentrations; 3) measures designed to reduce exposure pathways or receptor access (wildlife fencing, avian deterrents, or other); and 4) other appropriate measures as approved by the BLM, NDOW, and NDEP.

Surface disturbance under the Proposed Action would increase the amount of erosion and sedimentation in the study area, which would affect water quality and could result in adverse indirect impacts on amphibian species. HES would implement and maintain stormwater control features and BMPs in accordance with the Rossi Mine SWPPP (AECOM 2012c) and the *Nevada Contractor's Field Guide for*

Construction Site Best Management Practices (NDEP 2008a) which would minimize these impacts to amphibians and other wildlife species.

Hazardous Materials Spill

The probability of a transportation-related spill along the transportation route is discussed in Section 3.7, Hazardous Materials and Solid Waste. The potential for wildlife exposure to toxic chemicals as a result of a transportation-related spill would be greatest if an accident were to occur near aquatic habitats. Spills in dryland habitat would pose minimal risk to most wildlife species since these spills would be adjacent to highways or roads and could be quickly contained and cleaned. Chemical materials of greatest concern would be diesel fuel. Diesel spills can contaminate soils, surface water, and groundwater in addition to adversely affecting aquatic and vegetative life. Although unlikely, a diesel spill could ignite from the accident and cause a wildland fire. Diesel contamination has a low potential to result in long-term impacts to soil, surface water, and groundwater due to the rapid containment and cleaning of the area. Fuels and hydrocarbons used during mining and processing operations would continue to be stored in areas protected by secondary containment measures. A list of fuels and hydrocarbons proposed for use during mining and processing operations, proposed storage quantities, and proposed usage rates is provided in **Table 2-6** of this EIS.

Proposed Communication Site

The installation of the proposed communications tower would result in temporary impacts from the presence of construction equipment and personnel at the communication site and the removal of approximately 0.009 acre of vegetation, as discussed in Section 2.3.9.11, Communication Tower Site. During the life of the mine, the communications tower may result in adverse impacts to avian species that could collide with the tower. The communication tower would not include guy wires or nighttime lighting; therefore, the risk of collision for avian species is considered to be minimal. The communication tower would provide an elevated perching location for predatory raptor and corvid (common raven [*Corvus corax*]) or common crow (*Corvus brachyrhynchos*) species, which could result in increased predation of terrestrial prey species within the immediate area around the tower and the viewshed of a perching raptor or corvid.

Aquatic Biological Resources

Surface Disturbance

Direct impacts on aquatic habitat and species would involve disturbances to stream, wetland, or pond habitat as a result of activities within or near these waterbodies. Construction activities associated with the expansion of the King North WRDF would occur in the area of the perennial stream (W-1) located within the study area (**Figure 3.14-4**). Intermittent streams and springs/seeps located in the central and southern portions of the study area where the Queen East WRDF, QLC, and Dawn WRDF are proposed for construction would be affected as well. Construction activities could result in soil disturbance and subsequent increased erosion, sedimentation, and salinity of surface waters either in the study area or downstream to the Boulder Creek and/or Little Coyote Creek drainages. The majority of streams within the study area are intermittent; therefore, sediment input to the drainages would likely be localized to areas near the proposed disturbance areas. Biological communities in these drainages are limited to macroinvertebrates and algae which can tolerate intermittent flow and low water levels. Applicant committed environmental protection measures include engineering practices and BMPs for sediment control which would reduce sediment input from project facilities and disturbed areas into these drainages, as defined by the site Storm Water Pollution Prevention Plan. Project-related impacts of added sediment into the drainages and associated impacts to aquatic biota (where present) are considered to be minor with the implementation of erosion control measures.

The expansion of existing facilities and construction of new facilities may impact the two small perennial ponds (W-2 and W-3) at the southern portion of the active mining area and the small unnamed seasonal ponds located throughout the study area; however, all ponds in the study area are human-made and only support habitat for aquatic invertebrates and vegetation. No fish or amphibian species were observed in these wetlands within the study area. Pacific tree frogs were heard chorusing at night in a drainage one mile northwest of the study area during surveys in 2013 (EcoSynthesis 2013).

Water Quality and Quantity

Water management activities would be operated in a similar manner as the existing system. HES would implement and maintain stormwater control features and BMPs in accordance with the Rossi Mine SWPPP (AECOM 2012c) and the *Nevada Contractor's Field Guide for Construction Site Best Management Practices* (NDEP 2008a). No impacts are likely to occur to aquatic biological resources.

Hazardous Materials Spill

Vehicle and equipment use in areas near wetlands or streams pose a risk to aquatic species from fuel spills or leaks reaching these waterbodies. The magnitude of the impact if a spill occurred would depend upon the volume spilled and the extent of dispersal within the waterbody. Adverse effects on aquatic species, primarily macroinvertebrates, could occur depending on the factors involving spill volume and hydrology conditions in the waterbody if fuel entered the waterbody. Spilled fuel products could result in mortalities to aquatic species or habitat degradation due to impacts to water quality. A list of fuels and hydrocarbons proposed for use during mining and processing operations, proposed storage quantities, and proposed usage rates is provided in **Table 2-6** of this EIS. HES would maintain and implement a SPCCP for hydrocarbons and potential releases as part of applicant committed environmental protection measures, which would reduce spill risks to a low level. As a result, potential for spill impacts on aquatic biological resources is considered to be low.

3.17.2.2 Reconfiguration Alternative

Surface Disturbance

Potential impacts to game and non-game wildlife species under the Reconfiguration Alternative would be similar to the Proposed Action but reduced in scope. The Reconfiguration Alternative was developed by the BLM, HES, and NDOW to address potential adverse impacts to migrating mule deer under the Proposed Action. Under the Reconfiguration Alternative, the sequencing of construction for the modified Dawn WRDF would be phased to ensure the conservation of a minimum 2,000 foot wide corridor for use by migrating mule deer. NDOW recommends that mule deer migratory corridor widths consist of a minimum of one km (approximately 3,280 feet) (NDOW 2012a). HES is limited in its ability to maintain a 3,280 foot-wide migration corridor by the locations of mineral deposits within the PoO boundary, the technical and economic feasibility aspects of ore and waste rock handling procedures, and mineral entry to the south of the Rossi Mine by the previously authorized Arturo Mine. Data collected under the proposed mule deer monitoring program discussed in Section 3.17.4, Potential Monitoring and Mitigation Measures, would assist BLM and NDOW in determining the efficacy of the 2,000 foot wide corridor in comparison to the NDOW recommend 3,280 foot wide corridor.

The modifications to facilities under the Reconfiguration Alternative would result in a reduced final footprint of the proposed Dawn WRDF which would reduce the amount of temporary surface disturbance in mule deer limited use range and movement corridor to 872 acres (approximately 13 percent less than the Proposed Action). This alternative would result in less adverse impacts specifically to seasonal mule deer movements within the project area; however, all wildlife species would experience less direct impacts from temporary habitat loss and fragmentation under the Reconfiguration Alternative as compared to the Proposed Action. The total amount of long-term surface disturbance to the mule deer limited-use range and migration corridor would be 144 acres. All other direct and indirect impacts associated with this alternative would be similar to the Proposed Action.

Reclamation of mining disturbance and removal of mining support and ancillary facilities would occur as presented in Section 2.3.12, Closure and Reclamation Plan. Impacts of reclamation and removal of mining facilities would be similar to impacts resulting from mine construction and operation, including the presence of vehicles, equipment, and reclamation staff within the PoO boundary. During reclamation, increased dust, vibration, and noise would result in increased temporary disturbance in the areas where reclamation is actively being implemented. Periodic monitoring of reclamation success would result in the presence of reclamation staff, vehicles, and equipment within the PoO boundary.

Human Presence and Noise

Impacts to wildlife would be the same as discussed under the Proposed Action.

Water Quality and Quantity

Impacts to wildlife would be the same as discussed under the Proposed Action.

Hazardous Materials Spill

Impacts to wildlife would be the same as discussed under the Proposed Action.

3.17.2.3 Livestock Fencing Alternative

Surface Disturbance

The Livestock Fencing Alternative (Fencing Alternative) would be similar to the Proposed Action, except that a three or four strand, wildlife friendly livestock exclusion fence would be installed around the perimeter of the PoO boundary as shown in **Figure 2-15**. Fences would be constructed according to wildlife friendly specifications discussed in Section 2.4.3, Livestock Fencing Alternative.

The construction of livestock fencing under the Fencing Alternative would result in 7 acres of short-term surface disturbance which would be in addition to the 973 acres of short-term surface disturbance under the Proposed Action resulting in a total of 990 acres of surface disturbance (0.7 percent greater than the Proposed Action) due to the construction of the livestock exclusion fence. Impacts due to long-term surface disturbance would be the same under the Fencing Alternative as under the Proposed Action. Potential impacts to big game resulting from the Fencing Alternative would include potential injury or mortality of individuals becoming entangled in or colliding with the fence itself in addition to the fact that migrating mule deer and other wildlife species would be forced to negotiate the fence as an obstacle to movement. Due to the wildlife friendly design of the Fencing Alternative, the risk of serious injury or mortality would be considered low. In the long-term, the Fencing Alternative would potentially reduce adverse impacts to big game species as big game species could be diverted away from areas of increased mining activity and traffic (i.e., King South WRDF, QLC North WRDF, and QLC East WRDF) which would reduce the potential for collisions with mining activity and traffic. All other aspects of the Proposed Action and Reconfiguration Alternative would remain the same if the Fencing Alternative is chosen for implementation by the BLM. The fence would be removed once the mine is reclaimed and revegetation is determined successful by the BLM and NDEP.

3.17.2.4 No Action Alternative

Surface Disturbance

Under the No Action Alternative, the proposed project would not be developed, and impacts to wildlife and aquatic resources would not occur beyond those impacts resulting from previously authorized disturbance. Under this alternative, 1,167 acres of potential wildlife habitat would not be disturbed or lost, as described under the Proposed Action. Additional habitat fragmentation and animal displacement would not occur, limiting the impacts to wildlife resources to existing conditions. Closure and reclamation of the existing and authorized mine disturbance and surface exploration activities within the project area would be conducted under the terms of current permits and approvals.

New disturbance to springs and seeps would not occur other than what was previously authorized under existing permits and approvals. Therefore, potential sedimentation on aquatic species and their habitat would not occur to the Little Coyote Creek and Boulder Creek drainages. A low level risk of fuel spills on aquatic habitat would continue to exist for the No Action Alternative, although the SPCC Plan would be implemented to reduce spill risks.

Human Presence and Noise

Under currently authorized disturbance, impacts resulting from human presence and noise include avoidance or accommodation similar to what is discussed under the Proposed Action. No additional impacts to wildlife would be expected under the No Action Alternative.

Water Quality and Quantity

Under currently authorized disturbance, impacts to water quality and quantity are similar to what is discussed under the Proposed Action. No additional impacts to wildlife would be expected under the No Action Alternative.

Hazardous Materials Spill

Under currently authorized disturbance, impacts to wildlife from potential hazardous materials spills are similar to what is discussed under the Proposed Action. No additional impacts to wildlife would be expected under the No Action Alternative.

3.17.3 Cumulative Impacts

The CESA for wildlife and aquatic biological resources is defined in Section 3.17.1, Affected Environment, and is shown in **Figure 3.17-1** and **Figure 3.17-2.** The past, present, and RFFAs are discussed in Section 3.2, Past, Present, and Reasonably Foreseeable Future Actions. RFFAs from mining and exploration activities are identified in **Table 3.2-1**; their locations are shown in **Figures 3.2-1 and 3.2-2. Figure 3.2-2** also shows some ROW actions.

3.17.3.1 Proposed Action

Wildlife Resources

The CESA for wildlife resources encompasses the extent of the Boulder Flat (#61) and Rock Creek Valley (#62) Hydrographic Basin (**Figure 3.17-1**) while the mule deer CESA comprises Management Area 6 (Hunting Units 061, 062, 064, 066, 067, and 068) (**Figure 3.17-2**). The CESAs include contiguous areas that provide important seasonal habitat for general wildlife species as well as mule deer. Cumulative impacts on wildlife in the CESAs have resulted primarily from disturbance related to mining, pipeline, transmission line, and fluid minerals projects; grazing and agriculture activities; and wildfires and wildfire re-seeding efforts. Development of reasonably foreseeable mine projects would continue to impact big game in their respective CESAs; however, most mine areas proposed for development within the Carlin Trend have been within or adjacent to existing mine areas (BLM 2010b, BLM 2010c).

Past, present, and RFFAs in the wildlife and mule deer CESAs have resulted, or would result, in the direct disturbance of habitat (**Table 3.17-3**). A portion of the cumulative disturbance areas have been, or would be, reclaimed or have recovered materially (i.e., wildfire areas). The reclaimed areas, and areas associated with habitat conversion, would be capable of supporting wildlife use; however, species composition and densities may change.

Management goals outlined by the Area 6 Mule Deer Working Coalition (MDWGC 2012) include the following principles:

- Develop habitat management practices that are understood by all stakeholders and are applied towards actions and activities considered for permit, authorization, or development on public or private lands.
- Promote maintenance of historic / adequate north-south movement corridors associated with wildlife.
- Reduce fragmented and degraded sagebrush habitat and move towards a healthier condition.
- Link existing and restored sagebrush / mule deer habitat.
- Encourage cooperation between private, state and federal landowners.
- Inform and educate landowners and the general public regarding the mule deer issue as it relates to various uses on lands in the area.

Wildfire throughout the wildlife and mule deer CESAs has contributed to cumulative impacts on all wildlife species. As shown in **Figure 3.2-3**, from 1980 to 2017, 439,909 acres of potential wildlife habitat have been affected by large-scale wildfires (NNRDA No Date, BLM 2017b). Wildfire has resulted in the temporary and long-term loss of shrubs and other vegetation that provides forage and cover to a variety

of wildlife species, which in turn has adversely affected mule deer and pronghorn herds throughout their respective CESAs. Impacts of wildfires to terrestrial wildlife species include loss of habitat (forage and cover) which can lead to mortality of big game species including mule deer and pronghorn, as well as other species. Wildfire also results in a reduction of canopy cover and forb and grass diversity, elements of plant communities which may recover with time. Approximately 1,668 acres within the PoO boundary have burned since 2000, which contributes incrementally to the cumulative impacts of wildfire on wildlife species (SRK 2013b, BLM 2017b).

Cumulative impacts to wildlife resources would be predominantly related to habitat loss, habitat fragmentation and animal displacement as described in Section 3.17.2.1, Proposed Action. Mining has removed wildlife habitat within the Carlin Trend area of the wildlife and mule deer CESAs as a function of fencing and/or disturbance associated with mining operations. Impacts to local mule deer migration under the Proposed Action are anticipated to be substantial due to the removal of the existing undisturbed migration corridor located between the Rossi Mine and Arturo Mine. Construction of the Dawn WRDF would effectively narrow the area for mule deer moving between important seasonal habitats near the Rossi Mine until reclamation is completed. Mule deer would have to navigate through active mining areas at the Rossi and Arturo mines resulting in increased stress and energy expenditure and potential for mortality from collisions with mining equipment. Mule deer that choose to instead navigate around the Rossi and Arturo mines to reach important seasonal habitats would be forced to travel several extra miles, thus increasing stress levels and energy expenditures that would likely result in increased mortality during harsh winter conditions. Other direct impacts to big game species include mortalities or injury resulting from vehicle collisions as well as indirect impacts such as avoidance, restriction of movement (due to new facilities or roads), displacement of animals from the RFFAs during all seasons, and increased potential for poaching/hunting.

The type and nature of cumulative impacts to raptor species would be similar to the direct and indirect impacts described in Section 3.17.2.1, Proposed Action, and would include direct mortality through vehicular traffic collisions due to increased access and activity in the area. Indirect impacts include habitat loss, degradation, and habitat fragmentation, as well as disturbance and displacement from areas with human activities. Nesting raptors in particular would be susceptible to these cumulative impacts especially due to mining activities in the Carlin Trend which has resulted in bird displacement and habitat fragmentation in areas that may currently be at the peak population for resident raptor species.

Small game species, small mammals, migratory birds, reptiles, and amphibians that occur in the CESA would continue to occupy their respective ranges and breed successfully; however, population numbers may decrease relative to the amount of cumulative habitat loss and disturbance from incremental development.

Table 3.17-4 presents information regarding the acreages of cumulative impacts from development projects located within NDOW Hunt Unit 068 which incorporates the majority of mining and other development within the central portion of the Carlin Trend mining area, which is a defined area within this hunt unit.

Table 3.17-3. Cumulative Wildlife, Mule Deer, Pronghorn, and Elk Habitat Disturbance

CESA and Habitat Type[1]	Total Acres of Habitat	Acres of Habitat Disturbed by Fire	Acres Disturbed by the Proposed Action	Acres of Habitat Disturbed by Mining Operations (Past, Present, and RFFAs)[2]	Acres of Habitat Disturbed by Utility and Energy Development (Past, Present, and RFFAs)	Total Acres of Habitat Disturbed	Percentage of CESA Habitat Disturbed by Cumulative Actions
Wildlife	632,757	439,909	1,167	40,374	419	481,869	76
Mule Deer – Limited Use/ Migration Movement Corridor	1,714,971	690,717	1,167	31,425	344	723,653	42
Pronghorn – Summer	2,754,695	1,318,501	1,167	23,891	1,629	1,345,188	49
Elk – Limited Use	2,103,387	943,031	1,108	23,287	1,609	969,035	46
Elk – Crucial Winter	348,082	269,575	59	12,689	4	282,327	81

Sources: SRK 2013b; NDOW 2014; BLM 2007a, BLM 2017b.

[1] The CESA for general wildlife species includes extent of the Boulder Flat (#61) and Rock Creek Valley (#62) Hydrographic Basin; the CESA for big game species (mule deer, pronghorn, elk) is the entire Management Area 6.
[2] See **Table 3.2-1** for a breakdown of mining projects.

Table 3.17-4. Cumulative Wildlife, Mule Deer, Pronghorn, and Elk Habitat Disturbance within Hunt Unit 068

CESA and Habitat Type	Total Acres of Habitat	Acres of Habitat Disturbed by Fire	Acres Disturbed by the Proposed Action	Acres of Habitat Disturbed by Mining Operations (Past, Present, and RFFAs)[1]	Acres of Habitat Disturbed by Utility and Energy Development (Past, Present, and RFFAs)	Total Acres of Habitat Disturbed	Percentage of Unit 068 Habitat Disturbed by Cumulative Actions
Wildlife	601,496	436,383	1,167	24,409	385	462,344	77
Mule Deer – Limited Use/ Migration Movement Corridor	1,630,244	687,635	1,167	19,843	316	708,961	43
Pronghorn – Summer	2,618,601	1,347,688	1,167	15,086	1,497	1,365,438	52
Elk – Limited Use	1,999,470	937,854	1,108	14,704	1,478	955,144	47
Elk – Crucial Winter	330,885	268,370	59	8,012	4	276,445	84

Sources: SRK 2013b; NDOW 2014; BLM 2007a, BLM 2017b.

[1] See **Table 3.2-1** for a breakdown of mining projects.

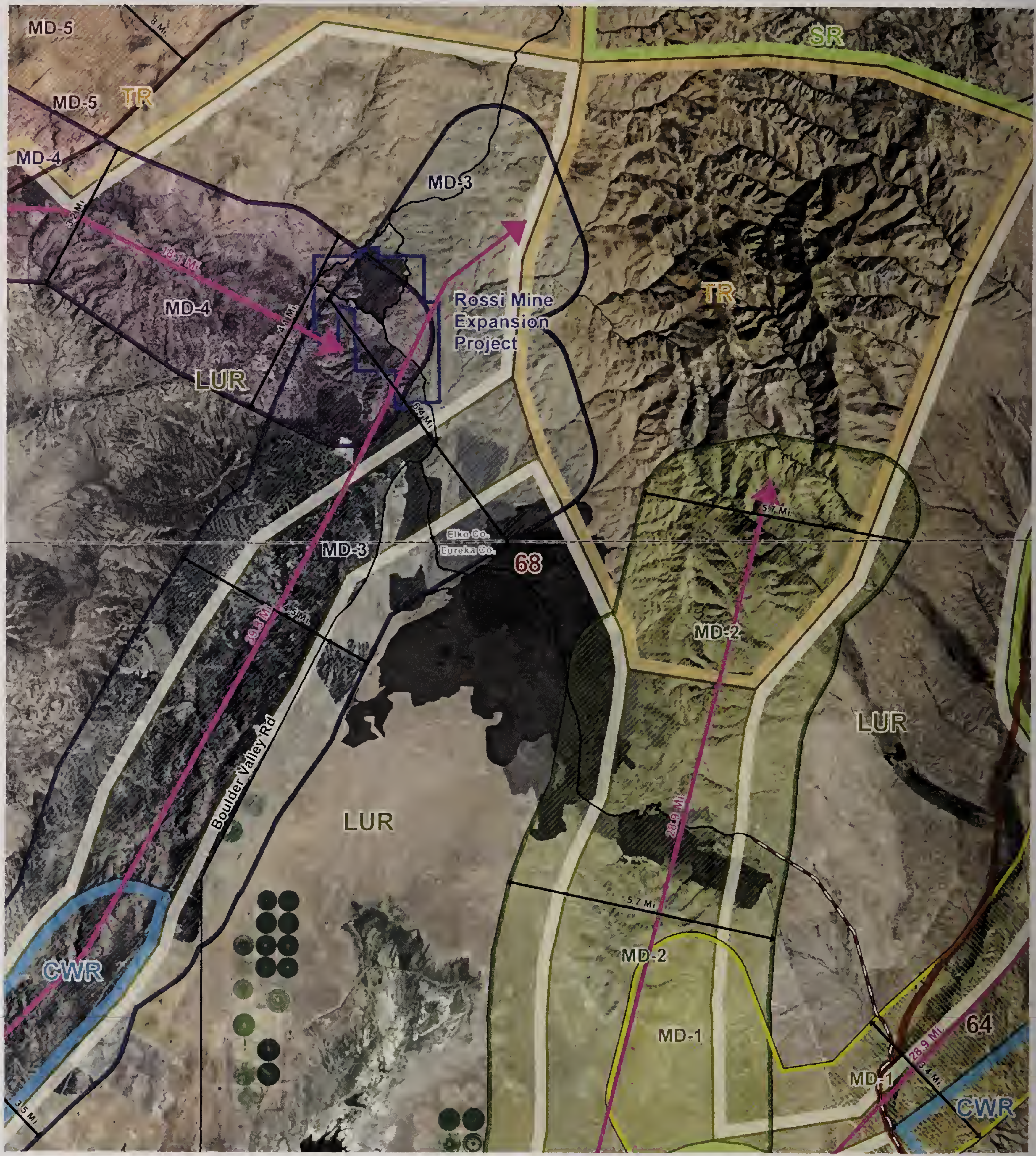
Mule Deer

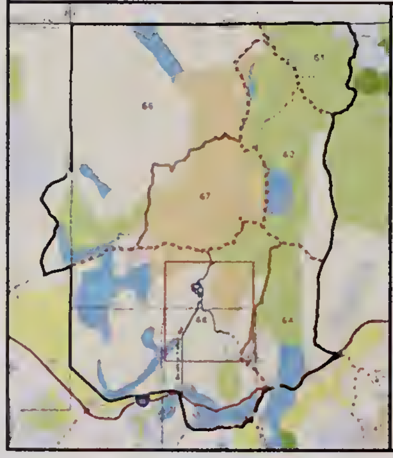
Big game species, especially mule deer utilizing habitat in Units 062 and 068, would be most susceptible to the cumulative impacts described above due to encroaching human activities along the foothills of the Tuscarora Range and the Carlin Trend which have resulted in animal displacement and habitat fragmentation in areas that are utilized as migration corridors between summer and winter ranges. NDOW collaring data demonstrated that mule deer tend to avoid large-scale mine disturbance areas along the Carlin Trend and choose specific routes through mine sites. Current migration routes used by mule deer in the Boulder Valley and Dunphy Hills area represent the remnants of historic migration corridors in the Carlin Trend and are further restricted by encroaching mine expansions and associated human activities including the Proposed Action (BLM 2010b, BLM 2010c). Existing disturbance from past and present projects that impacts the mule deer migration corridor is presented in **Figure 3.17-6**. Exploration and mining activity in the Carlin Trend over the past 100 years have significantly limited the available undisturbed habitat that mule deer require to migrate successfully between seasonal ranges in the project vicinity. This reduction of suitable migration corridors in conjunction with large expanses of wildfire in important summer and winter mule deer ranges has contributed to the steady decline of Area 6 mule deer herd numbers observed since the 1960s.

Anticipated disturbance under the Proposed Action and other RFFA that impact the mule deer migration corridor is presented in **Figure 3.17-7**. **Figure 3.17-8** provides a comparison of the existing and authorized development at the Rossi and Arturo mines in relation to the mule deer migration corridor with the areas of surface disturbance that would result under the Proposed Action. Under existing authorization the width of the current mule deer migration corridor between the Rossi and Arturo mines would remain at approximately 3,466 feet at its narrowest point (**Figure 3.17-8**). The lower half of **Figure 3.17-8** presents the anticipated widths of the mule deer migration corridor under the Proposed Action and the final build out of the Arturo Mine that was approved in 2014. Under this scenario, the width of the existing mule deer migration corridor would be reduced to approximately 314 feet at the narrowest point between the east lobe of the Arturo Mine and the proposed Dawn WRDF. This constriction would effectively discourage and may remove the ability for mule deer to migrate through the area using the existing migration corridor as the slopes of the proposed WRDF and Arturo open pit would be difficult for mule deer to navigate and the increased noise and human presence resulting from mining activity would discourage mule deer from using what remains of the migration corridor. Under this scenario, mule deer would be forced to navigate through areas of active mining or to travel around the north side of the Rossi Mine to access the important seasonal habitats to the northeast and southwest of the project area. Mule deer could also migrate around the southern end of the Carlin Trend mines although this would add considerable distance to the migration and would likely result in increased mortality.

Human related disturbances have been shown to divert time and energy away from foraging, resting, and other activities that improve fitness, which would be important to wintering ungulates whose nutritional condition is closely linked to survival (Frid and Dill 2002; Gill et al. 1996). These human-related disturbances on wildlife energetics, demography, and habitat selection are particularly important among temperate ungulates whose survival depends on minimizing energy expenditures during winter (Hobbs 1989; Parker et al. 1984). Furthermore, animals displaced from disturbed sites may experience greater intraspecific competition or density dependent effects when congregating into smaller areas of undisturbed or suboptimal habitat (Gill and Sutherland 2000).

Due to the level of past, present, and RFFAs in the CESA, there is limited availability of undeveloped, suitable habitat for mule deer in the CESA. In addition, indirect impacts from ongoing projects and RFFAs could extend far beyond the footprint of disturbance, resulting in synergistic adverse effects on the limited amount of undeveloped habitat available for migration between important seasonal ranges within certain portions of the species range. As a result, the Proposed Action could create a situation in which mule deer are displaced from the project area and have limited suitable areas in the CESA in which to transition between important seasonal habitats that support their life history requirements; thus contributing to adverse cumulative impacts to mule deer.





Project Study Area
Big Game CESA
Developed Areas
Quarries-Strip Mines-Gravel Pits

Mule Deer Seasonal Ranges
Summer Range (SR)
Transition Range (TR)
Limited Use Range (LUR)
Crucial Winter Range (CWR)

NDOW Hunt Unit

Mule Deer Corridor Groups
MD-1
MD-2
MD-3
MD-4
MD-5
Corridor Length
Corridor Width

Source BLM 2010b, SRK 2014a, NDOW 2014.

Rossi Mine Expansion Project EIS

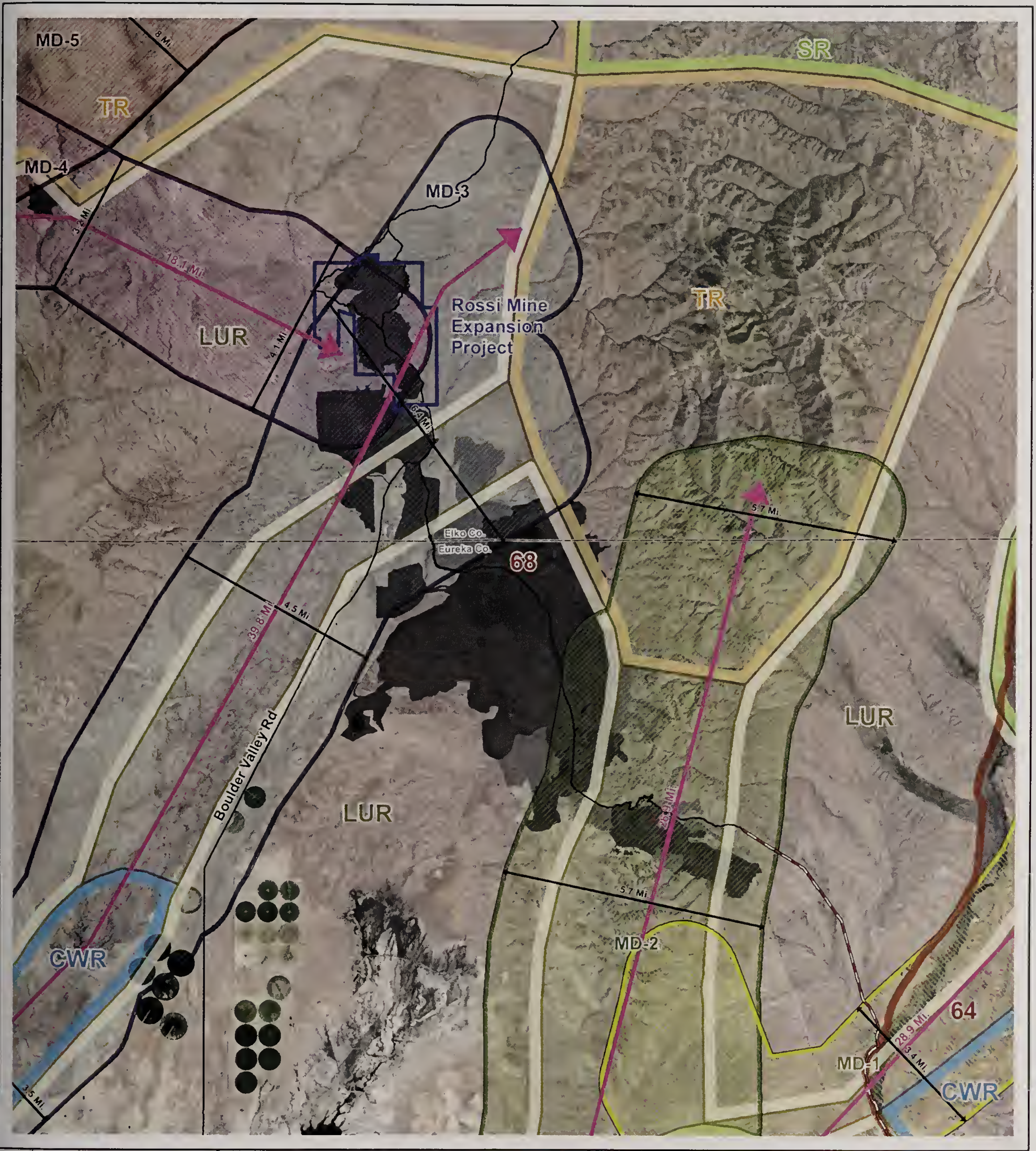
Figure 3.17-6

Existing Mining Disturbance and Mule Deer Movement Corridors within the Project Area

0 1 2 3 Miles
0 1 2 3 Kilometers
1:200,000

2/20/2018

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notice.



Project Study Area
Big Game CESA
Developed Areas
Quarries-Strip Mines-Gravel Pits

Mule Deer Seasonal Ranges

Summer Range (SR)
Transition Range (TR)
Limited Use Range (LUR)
Crucial Winter Range (CWR)

NDOW Hunt Unit

Mule Deer Corridor Groups

MD-1
MD-2
MD-3
MD-4
MD-5
Corridor Length
Corridor Width

Source: BLM 2010b, SRK 2014a, NDOW 2014

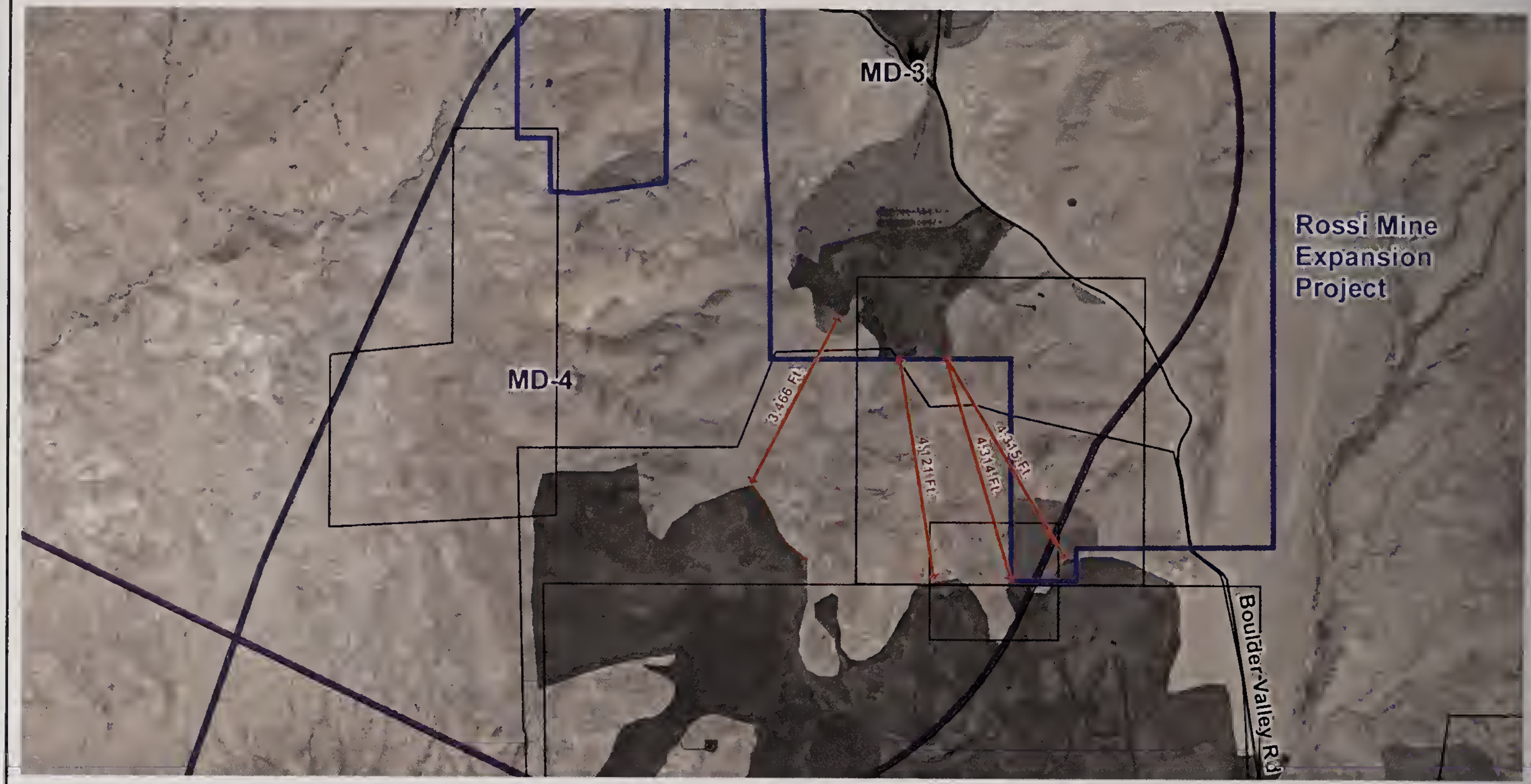
Rossi Mine Expansion Project EIS

Figure 3.17-7

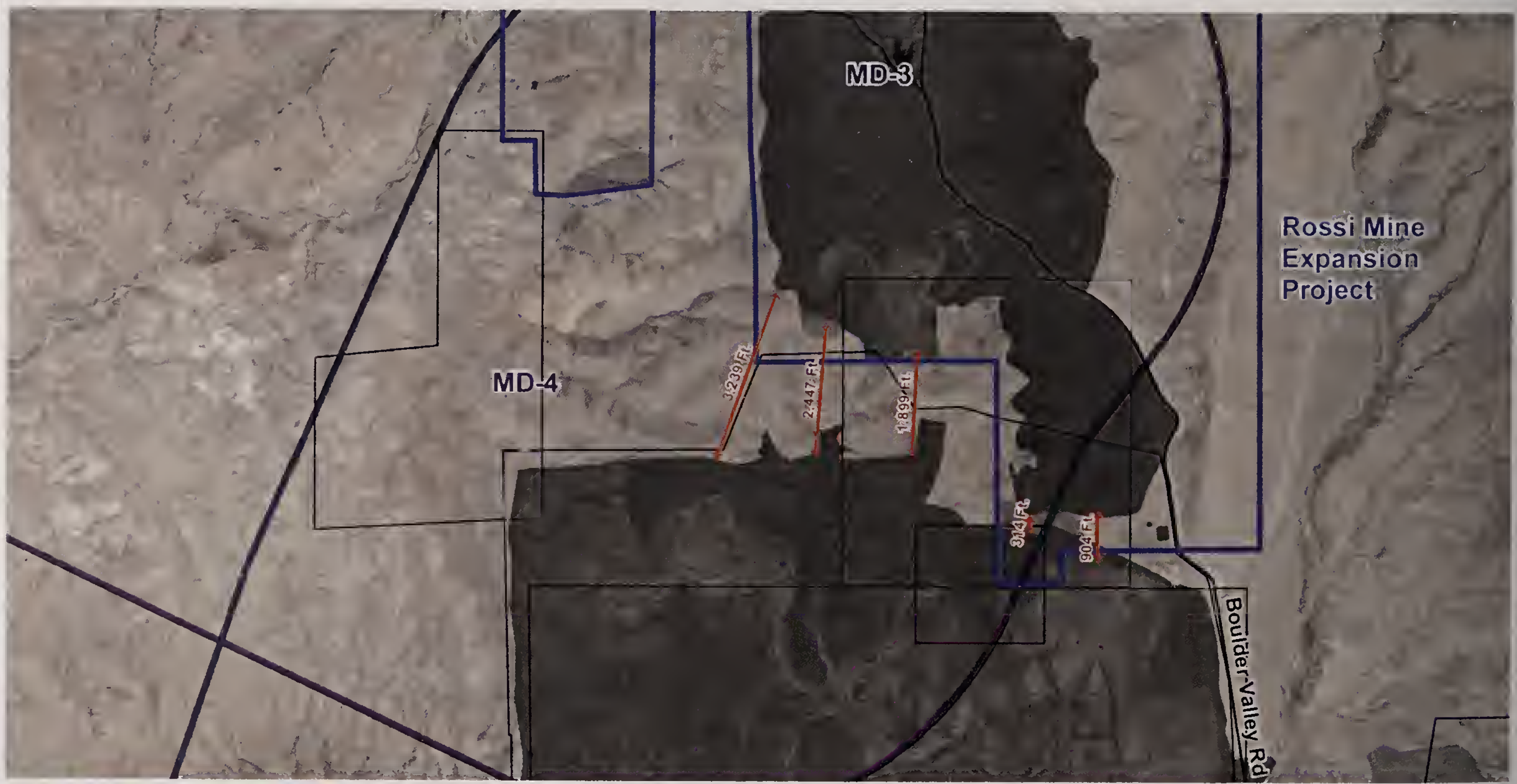
Rossi Proposed Action and Proposed/Existing Mining Disturbance and Mule Deer Movement Corridors within the Project Area

0 1 2 3 Miles
0 1 2 3 Kilometers
1:200,000

Existing/Authorized Disturbance



Proposed Disturbance (Proposed Action)



Mine Plan Boundaries
Developed Areas
Quarries-Strip Mines-Gravel Pits

Mule Deer Corridor Groups
MD-3
MD-4
Reduced Corridor Width

Source BLM 2010b, SRK 2014a, NDOW 2014

Rossi Mine Expansion Project EIS

Figure 3.17-8

Mule Deer Movement Corridors between Rossi Mine Proposed Action and Authorized Arturo Mine

0 0.25 0.5 0.75 1 Miles
0 0.5 1 Kilometers
1:48,000

10/12/2017

Aquatic Biological Resources

The CESA for aquatic biological resources includes portions of the Maggie Creek, Rock Creek Valley, and Boulder Flat Hydrographic Basins (**Figure 3.14-5**). The proposed project would contribute minor adverse impacts on aquatic biological resources in Maggie Creek and Rock Creek as a result of erosion from surface disturbance activities and low risk from potential fuel spills. These impacts would combine with other past, present, and RFFAs in the Maggie Creek, Rock Creek Valley, and Boulder Flat Hydrographic Basin. Erosion control measures have been required on other mining projects in the CESA to reduce sediment input to Boulder Creek; however, collectively, these projects likely have resulted in some low level of sediment input into the drainage. The proposed project could contribute incrementally to sediment into the Boulder Creek.

Other activities such as livestock grazing and agricultural development in the CESA would contribute to adverse impacts on aquatic biological resources. Potential cumulative effects to aquatic habitat and species include degradation of habitat from livestock grazing, conversion of native riparian and wetland plant communities to vegetation dominated by noxious weeds and non-native invasive plant species, and new roads. Mitigation programs implemented by other mining projects would reduce these potential impacts to the Hydrographic Basin.

Climate Change

Potential changes to the project area resulting from the effects of climate change forecasted by the Central Basin and Range Rapid EcoRegional REA could include higher than normal growing season temperatures, contraction or expansion of some existing vegetation communities, the expansion of existing noxious weed populations, and the introduction of noxious weed species previously undocumented in the ecoregion and project area (Comer et al. 2013). Regarding temperature increases specifically, the Central Basin and Range REA forecasts an average increase in average summer maximum daytime temperatures of approximately 5°F within the project area by 2060 (Comer et al. 2013). These increases in average growing season temperatures are anticipated to result in low elevation basins throughout the Central Basin and Range ecoregion potentially transitioning from the existing cool semi-desert vegetation communities into very warm and sparsely-vegetated desert landscapes more typical of the Mojave Basin and Range. These potential shifts in vegetation communities could result in changes to wildlife species diversity and population densities. A number of studies have documented a decrease in biomass and productivity resulting from climate change in the Southwest. Anderson-Teixeira et al. (2011) found that the amount of above-ground plant biomass decreased as temperature increased and precipitation decreased in a central New Mexico study. With increasing atmospheric CO_2 levels, cheatgrass and other introduced annual grasses are expected to proliferate and continue to outcompete native species which can be expected to increase the frequency and size of wildfires in the area (Smith et al. 2000). An increase in wildfire frequency may result in the reduction of important seasonal habitats for big game and other wildlife species within the project area and CESA. Ultimately, biodiversity in the CESA could be significantly reduced, which in turn might alter ecosystem processes such as primary production, nutrient dynamics and landscape water balance.

3.17.3.2 Reconfiguration Alternative

Cumulative effects under the Reconfiguration Alternative would be similar to wildlife resources discussed for the Proposed Action, except that 151 fewer acres of wildlife habitat would be disturbed during the life of the mine and 50 fewer acres would be disturbed permanently. Implementation of this alternative would result in less cumulative impacts to seasonal movements of mule deer by reducing the final footprint of the proposed Dawn WRDF which would maintain a larger area of current limited use range and movement corridors.

Anticipated disturbance under the Reconfiguration Alternative and other RFFAs that impact the mule deer migration corridor is presented in **Figure 3.17-9**. **Figure 3.17-10** provides a comparison of the existing and authorized development at the Rossi and Arturo mines in relation to the mule deer migration corridor with the areas of surface disturbance that would result under the Reconfiguration Alternative. Under existing authorization the width of the current mule deer migration corridor between the Rossi and Arturo mines would remain at approximately 3,466 feet at its narrowest point (**Figure 3.17-10**). The lower half of

Figure 3.17-10 presents the anticipated widths of the mule deer migration corridor under the Reconfiguration Alternative and the final build out of the Arturo Mine that was approved in 2014. Under this scenario, the width of the existing mule deer migration corridor would be reduced to approximately 1,787 feet at the narrowest point between the east lobe of the Arturo Mine and the proposed Dawn WRDF. Although the proposed Dawn Pit is located in the middle of the migration corridor, this facility would be prioritized for development and would be mined and reclaimed prior to the development of the proposed Dawn WRDF. The resulting long-term constriction of the migration corridor would reduce the ability for mule deer to migrate through the area in comparison to the No Action Alternative. In comparison to the Proposed Action, the remaining undisturbed or reclaimed sections of this important mule deer migration corridor would allow for increased use of the corridor during seasonal migrations. As a result of the configuration of facilities to allow for the maintenance of an unobstructed corridor, cumulative impacts to migrating mule deer would be less pronounced under the Reconfiguration Alternative.

The cumulative impacts of the Reconfiguration Alternative to aquatic biological resources would be similar to those described for the Proposed Action. The potential for erosion and sedimentation within the Hydrographic Basin would be less under the Reconfiguration Alternative as compared to the Proposed Action due to the smaller footprint of the proposed Dawn WRDF.

3.17.3.3 Livestock Fencing Alternative

Cumulative effects under the Livestock Fencing Alternative would be the same as those discussed under the Proposed Action, except that an additional 7 acres would be temporarily disturbed. Upon successful reclamation and revegetation as determined by BLM and NDEP, the fence would be removed.

3.17.3.4 No Action Alternative

Cumulative impacts resulting from past, present, and RFFAs to wildlife resources for the No Action Alternative would generally be the same as those described for the Proposed Action. However, there would be 1,167 acres less of surface disturbance and associated habitat fragmentation within the CESA under the No Action Alternative. Impacts to the existing mule deer migration corridor would be limited to those resulting from previously authorized actions for the Rossi Mine and Arturo Mine.

Potential sediment and fuel spill risks would continue to exist within the CESA under the No Action Alternative; however, existing sediment-control and spill plans would be used to minimize impacts to the Hydrographic Basins in the CESAs. These low level impacts would combine with other surface disturbance activities associated with RFFAs within the CESA.

3.17.4 Potential Monitoring and Mitigation Measures

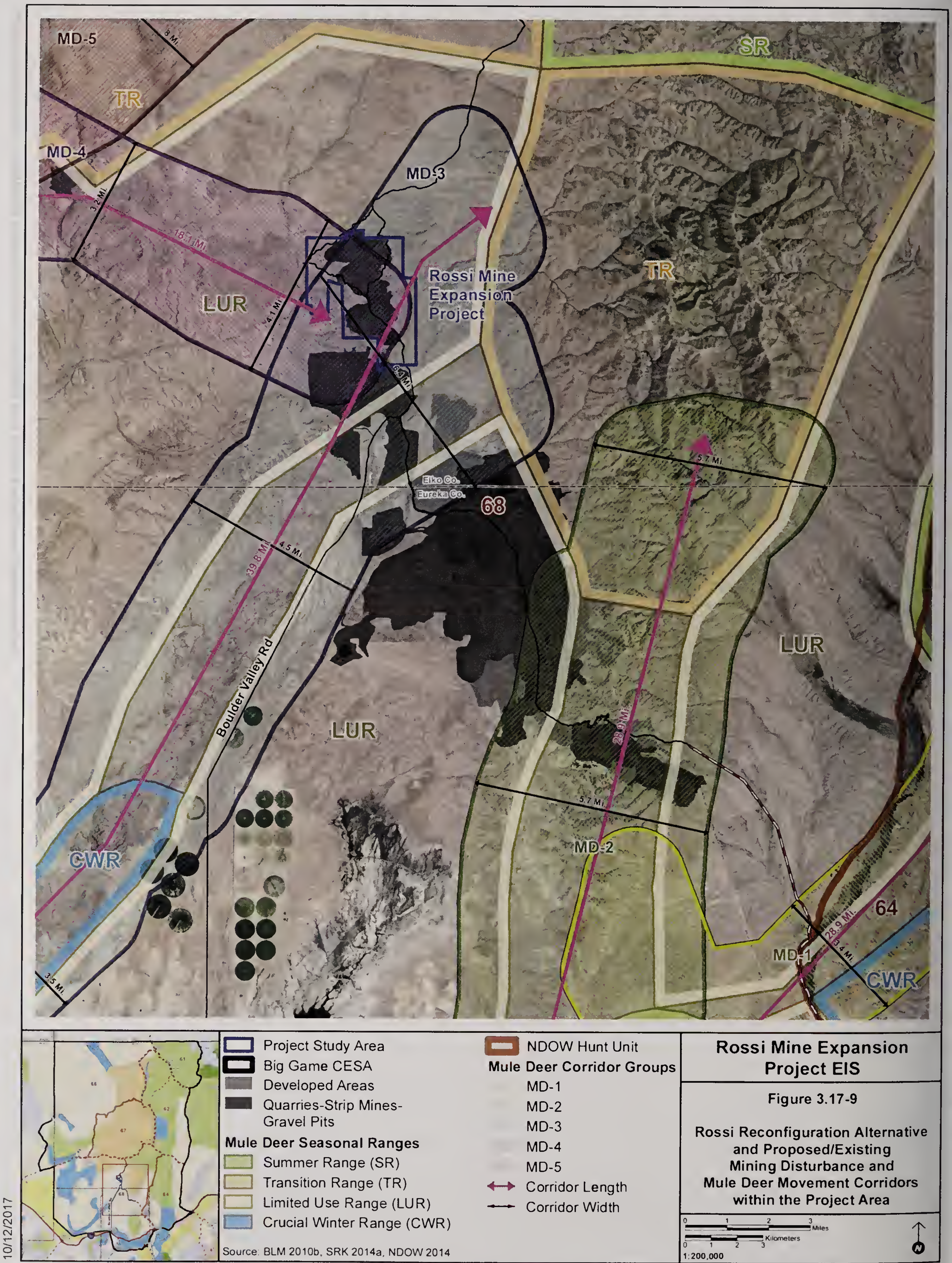
Off-site compensatory mitigation for wildlife is a voluntary action under the 43 CFR 3809 Regulations and BLM IM 2018-093. HES is considering whether to voluntarily conduct the following potential monitoring and mitigation measures or a variation of them. Accordingly, the voluntary mitigation has been included and analyzed in this document. HES is required to complete reclamation of the surface disturbance associated with the Rossi Mine for both mining operations and exploration activities, as outlined in this document at section 2.3.12. In the event that HES does not volunteer to conduct any of the potential monitoring or mitigation measures described below, the reclamation of the mining operations and exploration activities would restore mule deer habitat in the migration corridors upon completion of the reclamation activities either concurrently or at the end of the mine life. However, approximately 194 acres of open pits for the Proposed Action or 144 acres of open pits for the Reconfiguration Alternative would remain at the end of the mine life and would not be reclaimed. HES has also proposed design features and applicant committed environmental protection measures in Table 2-16 to address migrating mule deer concerns resulting from the proposed action in order to minimize impacts to mule deer migration.

Issue: Impacts to mule deer transition habitat and the migration corridor located between the Rossi Mine and the Arturo Mine.

Mitigation Measure WL-1: HES could voluntarily mitigate for acres of transitional migratory habitat within the migration corridor that would be disturbed by the expansion of the King Pit and western portion of the

QLC Pit at a 1:1 ratio or variation such as the permanent loss of open pit acreage. Under the Proposed Action, approximately 1,167 acres would be temporarily disturbed by mining activity and 194 acres would be permanently removed by open pits for the proposed action and 144 acres of open pits would remain unreclaimed for the Reconfiguration Alternative.

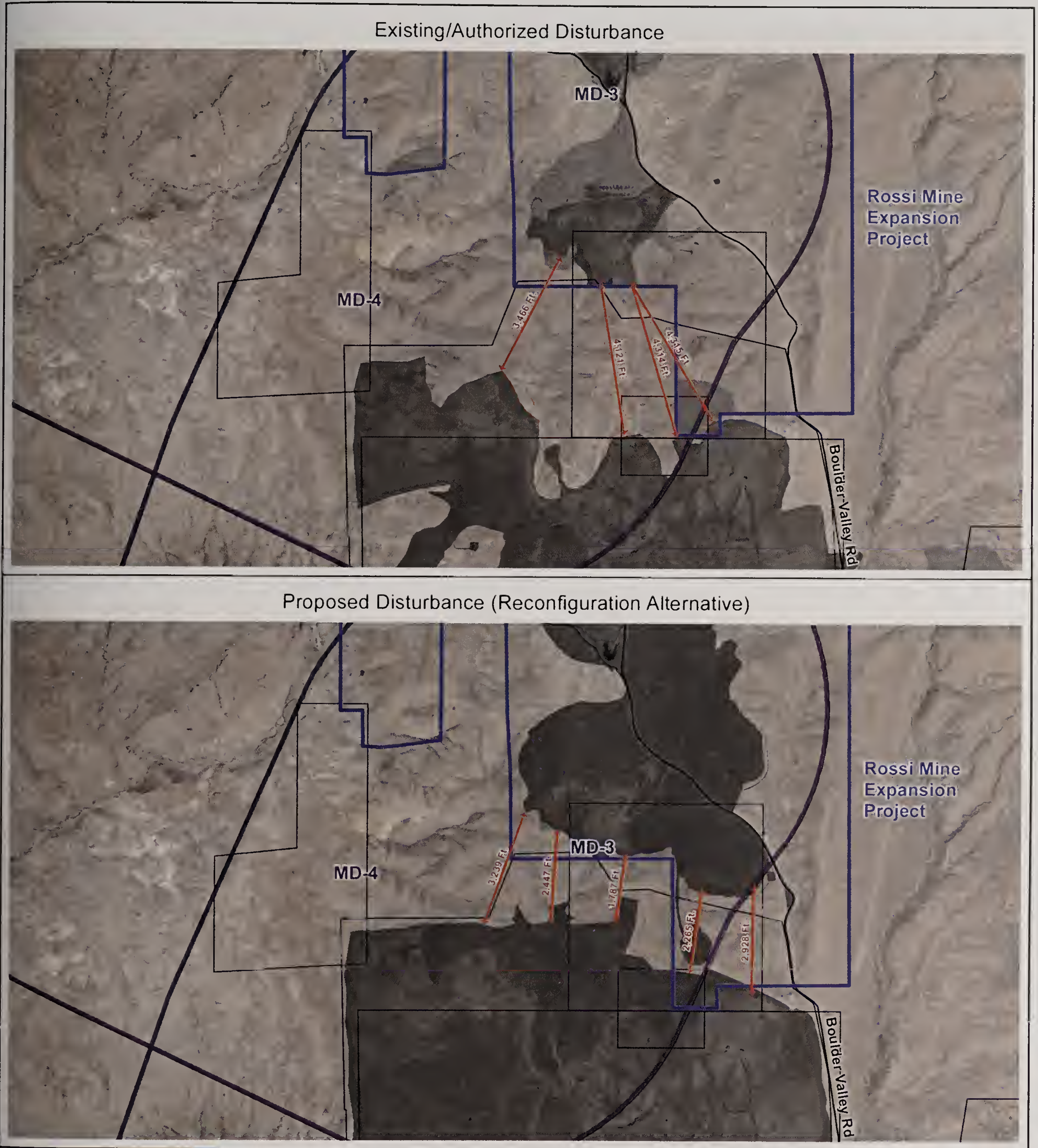
HES's decision to implement compensatory mitigation could include habitat enhancements at the primary off-site habitat enhancement area identified by BLM in coordination with NDOW (**Figure 3.17-11**). These primary off-site habitat enhancement areas are located within the 2017 Rooster Comb fire perimeter. An alternative to treating the specific primary off-site locations identified on **Figure 3.17-11** would be for HES to coordinate with the BLM to supplement the BLM's fire rehabilitation efforts within the 2017 Rooster Comb fire perimeter. The BLM would assist HES in the formation of a wildlife working group (WWG) to implement this mitigation item, which would be comprised of representatives from BLM, HES, NDOW, the current grazing permittee and others. Habitat enhancements would include, but are not limited to, mechanical soil treatments, browse species seeding, herbicide treatment, prescribed burn treatments, development of fire breaks, fencing to provide rest from livestock grazing, cultural resource inventories, or other habitat enhancements beneficial to the Area 6 mule deer. This mitigation measure may include fencing the treatment area for a minimum of three growing seasons.



Rossi Mine Expansion Project EIS

Figure 3.17-9

Rossi Reconfiguration Alternative and Proposed/Existing Mining Disturbance and Mule Deer Movement Corridors within the Project Area



Mine Plan Boundaries

Developed Areas

Quarries-Strip Mines-Gravel Pits

Mule Deer Corridor Groups

MD-3

MD-4

Reduced Corridor Width

Source: BLM 2010b, SRK 2014a, NDOW 2014.

Rossi Mine Expansion Project EIS

Figure 3.17-10

Mule Deer Movement Corridors between Rossi Mine Reconfiguration Alternative and Authorized Arturo Mine

0 0.25 0.5 0.75 1 Miles

0 0.5 1 Kilometers

1:48,000

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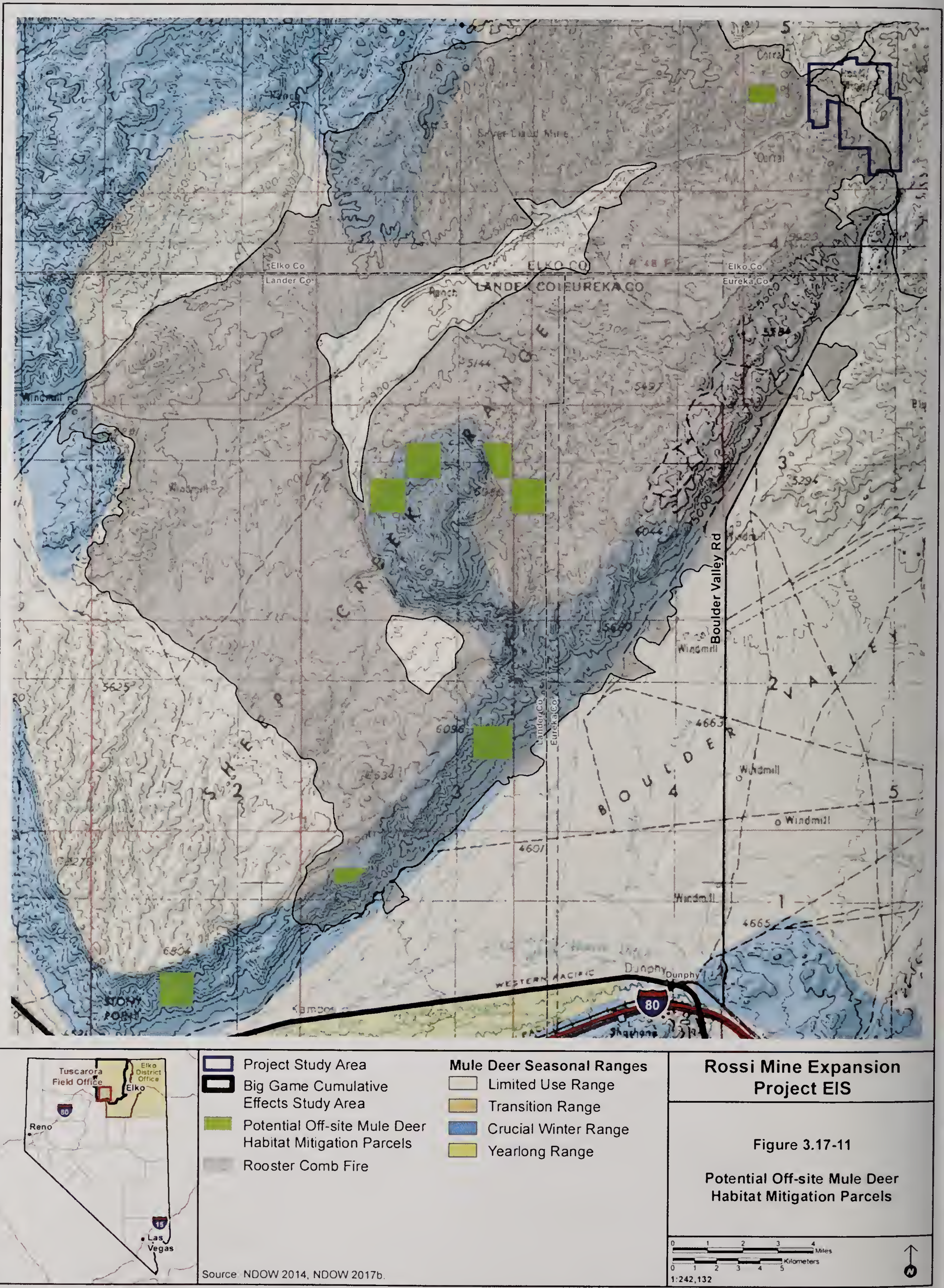

Rossi Mine Expansion Project EIS

Figure 3.17-11

Potential Off-site Mule Deer Habitat Mitigation Parcels

2/20/2018

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The types of habitat enhancement efforts that could be considered for funding and implementation under WL-1 include but are not limited to:

- **Seeding Treatments** – Possible seeding treatments include broadcast and drag, drill, broadcast/aerial, harrow, disking and hand.
- **Mechanical Treatment** – To provide for an adequate seedbed, mechanical treatments would include disking (plowing), harrowing and mowing existing grasses.
- **Livestock Grazing and Protective Fencing** – Rest from livestock grazing.
- **Herbicide Treatment** – A combination of Imazapic and Glyphosate herbicide treatments would be used to suppress nonnative annuals and crested wheatgrass in order to introduce shrubs, forbs and grasses into the treatment areas.
- **Prescribed Burn Treatments** – Controlled burns would be used to reduce fuels, control competing vegetation, and improve wildlife habitat.
- **Cultural Resource Inventory** – Treatment areas located on public lands would require a cultural resource inventory prior to implementation of any ground disturbing habitat enhancement efforts. Cultural resource needs would be determined by the BLM. The BLM would be required to complete Section 106 Consultation with SHPO, prior to any implementation of the voluntary compensatory mitigation measures on public lands.

Restoration activities would occur within an 8-year period and would commence within 1–2 years of the initiation of the project approval.

3.17.4.1 Monitoring of Compensatory Mitigation Effectiveness

The desired outcome of habitat enhancements is the production of a functioning and stable habitat for mule deer and other native wildlife species within the final selected treatment parcel from the potential parcels identified in **Figure 3.17-11**. HES's decision to implement compensatory habitat enhancements and vegetation rehabilitation treatments would be monitored using techniques outlined by the USGS in the Strategy for Monitoring Post-fire Rehabilitation Treatments Handbook. Treatment goals would be set by the BLM or a WWG, if established, prior to treatment implementation and would include consideration of site conditions pre-treatment, treatment method and species planted. Invasive species management treatments (including chemical, manual and mechanical treatments) would be considered effective if greater than 80 percent of the targeted weed species are affected by the treatment during the year. Infestation size and density would be measured annually to determine progress and to adapt management plans for treatment areas.

3.17.4.2 Monitoring of Area 6 Mule Deer Movements

According to NDOW, HES is also considering whether to voluntarily participate in assisting NDOW to actively monitor mule deer seasonal movements through the Rossi Mine area by providing funding or other assistance to NDOW's mule deer collaring and monitoring program for the Area 6 mule deer population. Under this measure, HES could provide initial funding of $8,025 to cover the costs of purchasing GPS collars and annual maintenance payments of $3,400 to cover the costs of data recovery and annual re-collaring efforts for collars that drop off due to mortality or battery issues. The annual maintenance cost could continue through the proposed 8-year life of mine extension. These costs represent approximately 25% of the total collaring estimated study costs. The remaining 75% of collaring study costs would be covered by a 3 to 1 matching federal Pittman–Robertson grant received through NDOW. NDOW would apply for matching grant funding from federal Pittman-Robertson upon the approval of the Rossi Mine ROD. A copy of the data would be provided to the BLM either in a report or an acceptable format determined by the BLM and NDOW.

Effectiveness: If HES decides to voluntarily participate in assisting NDOW, implementation of this mitigation measure help to determine and document where mule deer travel or migrate in the vicinity of the Rossi Mine. This action would provide information to the NDOW and BLM regarding how mule deer are traversing through and around the Rossi Mine in order for the agencies to determine to what extent the mule deer migration routes are actually impacted.

Issue: Impedances to mule deer migration within the migration corridor.

Mitigation Measure WL-2: HES, in coordination with the BLM and NDOW, would conduct an annual field review of the mule deer migration corridor in the vicinity of the Dawn Pit and Dawn WRDF prior to September 30th to determine if any impedances to migration exist. In the event that unnecessary impedances do exist within the migration corridor, HES would take corrective action to reduce or eliminate the impedance prior to October 30th of that year. This measure would occur until the earthwork portion of reclamation is completed at the Dawn Pit and southern end of the Dawn WRDF.

Effectiveness: Implementation of this mitigation measure would avoid and reduce project-related impacts to mule deer by ensuring that unnecessary impedances to migration within the corridor are removed prior to seasonal migration periods.

3.17.5 Residual Impacts

Under the Proposed Action, residual impacts to wildlife resources would include the permanent loss of 194 acres of wildlife habitat resulting from open pits that would not be reclaimed. These permanent impacts would include 53 acres of Mixed Mountain and Low Sagebrush, 23 acres of Mixed Black, Wyoming and Mountain Sagebrush, 16 acres of annual grasslands, 6 acres of Mixed Wyoming and Mountain Sagebrush, one acre of meadow habitat, and 95 acres of previously disturbed lands that would be permanently unavailable to wildlife species. The loss of shrub-dominated communities would represent a long-term change in wildlife habitat composition (i.e., shrub-dominated communities to grass/forb-dominated communities) under the Proposed Action because it would take approximately 25 years for mature shrubs to become established in these communities.

Under the Reconfiguration Alternative, residual impacts to wildlife resources would include the permanent loss of 144 acres of wildlife habitat, resulting from open pits that would not be reclaimed. These permanent impacts would include 48 acres of Mixed Mountain and Low Sagebrush; 10 acres of Mixed Black, Wyoming, and Mountain Sagebrush; 16 acres of annual grasslands; 1 acre of meadow habitat; and 69 acres of previously disturbed lands that would be permanently unavailable to wildlife species.

3.18 Special-Status Species

3.18.1 Affected Environment

The study area for special-status species is the project area boundary. The CESA for the majority of special-status species is the same as the CESA described for general wildlife species in Section 3.17.1, Wildlife and Aquatic Biological Resources (**Figure 3.17-1**). Similar to the general wildlife CESA, this CESA is also based on wildlife use within the project region and important seasonal habitats. The greater sage-grouse (GRSG) CESA is the Tuscarora Population Management Unit (PMU), which is a general delineation of GRSG populations based on aggregations of leks, understanding of habitats, and potential topographical boundaries to populations (such as mountains and valleys) (NGSGCT 2004) (**Figure 3.18-1**). The CESA for special-status aquatic resources is the same as the CESA for aquatic biological resources presented in Section 3.17, Wildlife and Aquatic Biological Resources, and encompasses portions of the Maggie Creek, Rock Creek Valley, and Boulder Flat hydrographic basins (**Figure 3.14-5**).

3.18.1.1 Regulatory Framework

Special-status species are those species for which state or federal agencies afford an additional level of protection by law, regulation, or policy. Included in this category are federally listed species that are protected under the Endangered Species Act (ESA), the BGEPA, and species designated as sensitive by the BLM. In addition, there is a State of Nevada protected animal list (Nevada Administrative Code 501.100–503.104) that the BLM has incorporated, in part, into its sensitive species list.

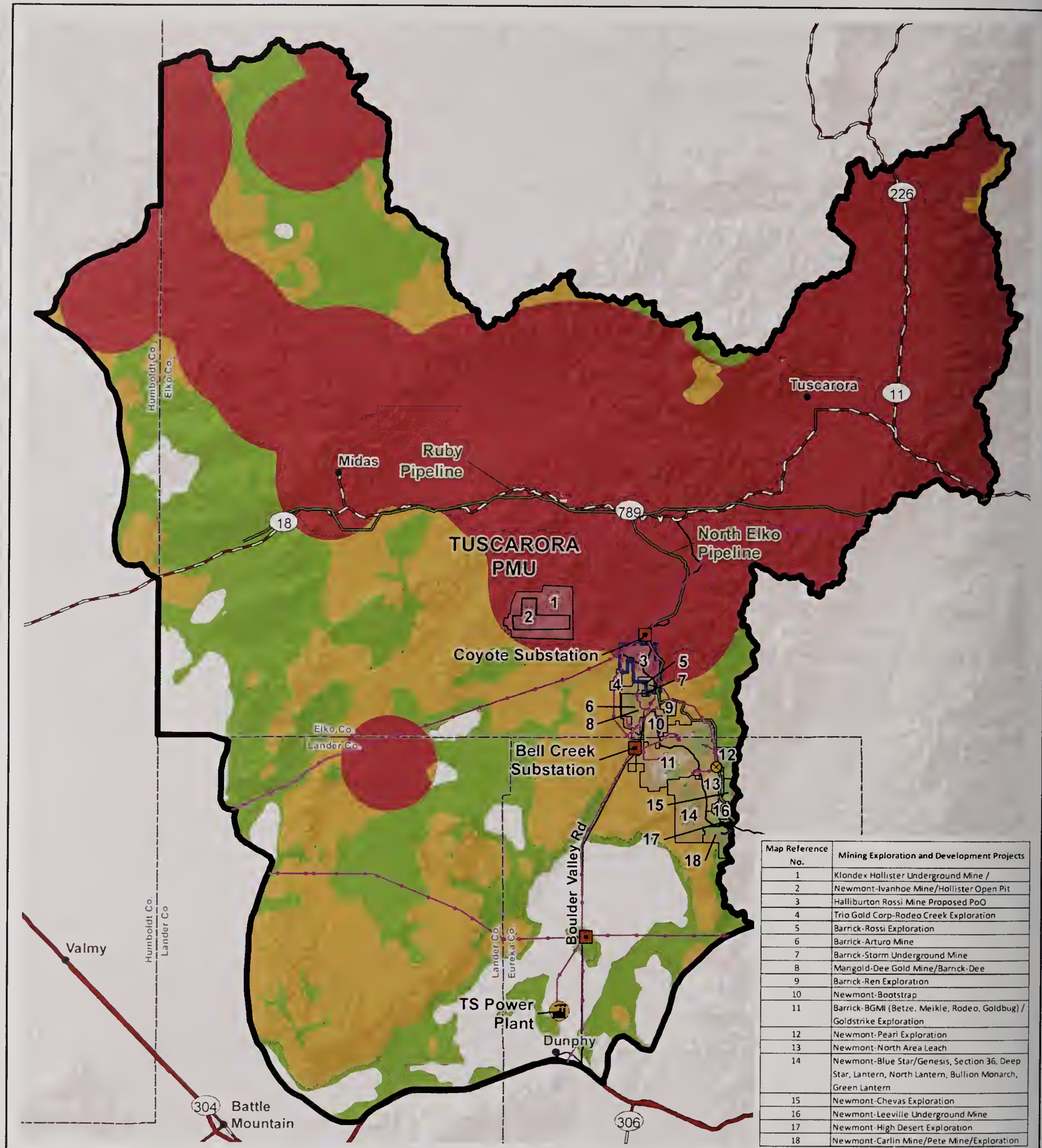
Endangered Species Act

In accordance with the ESA, as amended, the lead agency (BLM) in coordination with the USFWS must ensure that any action that they authorize, fund, or carry out would not adversely affect a federally listed threatened or endangered species. In addition, as stated in Special-Status Species Management Policy 6840 (6840 Policy) (Rel. 6-125), it also is BLM policy “to conserve and/or recover ESA-listed species and the ecosystems on which they depend so that ESA provisions are no longer needed for these species, and to initiate proactive conservation measures that reduce or eliminate threats to BLM sensitive species to minimize the likelihood of and need for listing of these species under the ESA.” There are no known occurrences of ESA plant or wildlife species that have been observed or have the potential to occur in the study area (USFWS 2015, SRK 2013b).

Bald and Golden Eagle Protection Act

Nongame birds are protected under the Migratory Bird Treaty Act (MBTA) and are discussed in Section 3.17.1.4, Nongame Species. In addition to the MBTA, bald and golden eagles are protected under the BGEPA (16 USC 668 et seq.). This statute prohibits anyone without a permit from committing “take” of bald and golden eagles, including their parts, nests, and eggs. “Take” is defined as the actions to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest and disturb. In 2009, the USFWS implemented two rules authorizing new permits under BGEPA.

- 50 CFR 22.26 would authorize limited “take” of bald and golden eagles where the “take” is associated with, but is not the purpose of an activity and cannot practicably be avoided.
- 50 CFR 22.27 would authorize the intentional take of eagle nests where necessary to alleviate safety hazards to people or eagles; to ensure public health and safety; where a nest prevents the use of a human-engineered structure; and when an activity, or mitigation for the activity, will provide a net benefit to eagles. Only inactive nests are allowed to be taken, except in the case of safety emergencies.



Map Reference No.	Mining Exploration and Development Projects
1	Klondex Hollister Underground Mine /
2	Newmont-Ivanhoe Mine/Hollister Open Pit
3	Halliburton Rossi Mine Proposed PoO
4	Trio Gold Corp-Rodeo Creek Exploration
5	Barrick-Rossi Exploration
6	Barrick-Arturo Mine
7	Barrick-Storm Underground Mine
8	Mangold-Dee Gold Mine/Barrick-Dee
9	Barrick-Ren Exploration
10	Newmont-Bootstrap
11	Barrick-BGMI (Betze, Meikle, Rodeo, Goldbug) / Goldstrike Exploration
12	Newmont-Pearl Exploration
13	Newmont-North Area Leach
14	Newmont-Blue Star/Genesis, Section 36, Deep Star, Lantern, North Lantern, Bullion Monarch, Green Lantern
15	Newmont-Chevas Exploration
16	Newmont-Leeville Underground Mine
17	Newmont-High Desert Exploration
18	Newmont-Carlin Mine/Pete Mine/Exploration

Tuscarora Field Office
Elko District Office
Elko
80
Reno
15
Las Vegas

Mine Boundary (Proposed)

Greater Sage-grouse Cumulative Effects Study Area

Greater Sage-grouse Management Categories (2014)

Priority Habitat Management Area (PHMA)

General Habitat Management Area (GHMA)

Other Habitat Management Area (OHMA)

Existing and Reasonably Foreseeable Projects

Metering Station

Power Plant

Substation

Pipeline

Road

Transmission Line

Mine Plan Boundaries

Source: BLM 2010b, BLM 2015a, SRK 2014a

Rossi Mine Expansion Project EIS

Figure 3.18-1

Greater Sage-grouse Cumulative Effects Study Area

0 1 2 3 4 5 10 Miles
0 1 2 3 4 5 10 Kilometers
1:600,000

N

10/12/2017

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BGEPA provides the Secretary of Interior (Secretary) with the authority to issue eagle-take permits only if the Secretary is able to determine that the take is compatible with the preservation of the eagle. This take must be "...consistent with the goal of increasing or stable breeding populations."

A total of 52 special-status wildlife species were identified as potentially occurring within the study area (BLM 2015d, Stantec 2015, SRK 2014f, SRK 2013b). These species, their associated habitats, and their potential for occurrence within the study area are summarized in **Appendix D**, Special-Status Species Potentially Occurring within the project area. Occurrence potential for each species within the study area and CESA was evaluated for each species based on their habitat requirements and/or known distribution. Eleven special-status wildlife species were confirmed by baseline surveys to occur within the study area are described below.

The study area for special-status plant species is the same as described for vegetation in Section 3.14, Vegetation, including Riparian Zones and Wetland Areas. No special-status plant species have been observed in the study area during baseline surveys; however, seven BLM sensitive species have the potential to occur in the study area based on the availability of suitable habitat. One State of Nevada protected species, the mountain ball cactus (*Pediocactus simpsonii*) was observed in the study area (SRK 2013b). These species and their potential for occurrence in the study area are summarized in **Appendix D**, Special-Status Species Potentially Occurring within the project area.

3.18.1.2 Mammals

Special-Status Bat Species

Federal and state sensitive bat species that have been identified as potentially occupying appropriate habitat types within or near the study area include Brazilian free-tailed bat (*Tadarida brasiliensis*), California myotis (*Myotis californicus*), little brown myotis (*Myotis lucifugus*), western small-footed myotis (*Myotis ciliolabrum*), and Yuma myotis (*Myotis yumanensis*). These species were detected during four acoustic night surveys; two nights in May and June and two nights in July and August, 2012 at a variety of suitable bat roosting and foraging areas in the study area. Marginal roosting and suitable foraging habitat is present in portions of the study area (SRK 2013b). In addition to those bat species detected during acoustic surveys, suitable habitat for the big brown bat (*Eptesicus fuscus)*, fringed myotis (*Myotis thysanodes)*, hoary bat (*Lasiurus cinereus)*, long-eared myotis (*Myotis evotis)*, long-legged myotis (*Myotis volans)*, pallid bat (*Antrozous pallidus)*, silver-haired bat (*Lasionycteris noctivagans)*, Townsend's big-eared bat (*Corynorhinus townsendii*), western pipistrelle (*Parastrellus hesperus*) and the spotted bat (*Euderma maculatum*) occurs within the project area.

Suitable bat foraging habitat is generally located near perennial water sources. Within the project area, suitable foraging habitat occurs in the areas of wetland and riparian vegetation associated with wetland features W-1 through W-7 (**Figure 3.14-4**). Additional marginal quality roosting habitat within the vicinity of the study area includes rock outcrops located near the western edge of the project area that may provide potential roosting habitat for bats.

<u>Big Brown Bat</u>

The Big-brown bat occurs throughout Nevada in low desert to high mountain habitats. The big brown bat is a medium- to large-sized bat that is known to roost in buildings, bridges, mines, caves, hollow trees, and rock crevices (Agosta 2002). Their primary diet includes beetles and they usually forage within a few kilometers of their roost. This bat can be locally common in some urbanized environments. Although this species was not detected during baseline acoustic surveys suitable habitat occurs within the project area.

<u>Brazilian Free-tailed Bat</u>

The Brazilian free-tailed bat occurs throughout Nevada in low desert to high mountain habitats predominantly at lower elevations (690-8,360 feet amsl) and is more common in southern Nevada. This species roosts in a variety of structures including cliff faces, mines, caves, buildings, bridges, and hollow trees (Bradley et al. 2006). This species was detected during acoustic surveys at a rock outcrop

in a draw near the western edge of the project area on May 29, 2012 and has been previously recorded southeast of the project area along the Humboldt River near Elko, Nevada (SRK 2013b, Bradley et al. 2006).

California Myotis

The California myotis is a year-round resident found throughout Nevada at low and middle elevations (690-8,950 feet amsl) and is found in a variety of habitats including lower Sonoran desert scrubs and forests. The California myotis is a crevice-roosting species and selects day roosts which include mines, caves, buildings, rock crevices, hollow trees, and under exfoliating bark. This species hibernates but may also actively forage during the winter months (Bradley et al. 2006). California myotis was possibly detected on May 28, 2012 at two locations associated with wetland features W-2 and W-3 (**Figure 3.14 4**); a positive acoustic identification could not be determined between California myotis and Yuma myotis for these saved acoustic files (SRK 2013b). This species has not been observed in the project region otherwise; however there is suitable foraging habitat and marginal roosting habitat located near the western edge of the project area.

Fringed Myotis

The fringed myotis ranges across much of western North America, occurring most commonly at middle elevations although its distribution is considered patchy (WBWG 2016). The species appears to be most common in drier woodlands (oak, pinyon-juniper, ponderosa pine) but is found in a wide variety of habitats including desert scrub, mesic coniferous forest, grassland, and sage-grass steppe. It feeds on a variety of invertebrate taxa and the relative importance of prey items may vary according to prey availability, geography, or time period (WBWG 2016). Although this species was not detected during baseline acoustic surveys suitable habitat occurs within the project area.

Hoary Bat

The hoary bat occurs throughout Nevada in coniferous forest habitats but is also know to forage in open habitats. The species is known for its relatively large size and golden-colored fur. Common roosting sites include coniferous and deciduous trees and caves. In the Pacific Northwest, hoary bats are common where they are highly associated with forested habitats (WBWG 2016). Primary food sources include beetles, moths, grasshoppers, dragonflies, and wasps. Although this species was not detected during baseline acoustic surveys suitable habitat occurs within the project area.

Little Brown Myotis

The little brown myotis occurs primarily in northern areas of Nevada at higher elevations often associated with coniferous forest and available water sources. This species hibernates during the winter; however, not hibernating colonies have been located within Nevada. Roost sites include hollow trees, rock outcrops, occasionally mines and caves, and most often roosts in buildings and other human structures (Bradley et al. 2006). Little brown myotis was acoustically detected within the project area on May 28 at two locations associated with wetland features W-2 and W-3 (**Figure 3.14-4**), and July 10 and 11, 2012 at a rock outcrop in a draw near the west end of the project area (SRK 2013b). This species has been previously recorded in Elko County north and northeast of the study area (Bradley et al. 2006).

Long-eared Myotis

The long-eared myotis occurs throughout Nevada in a diverse array of habitats, including lowland, montane, and subalpine woodlands, forests, shrublands, and meadows, wooded stream courses, and areas over water bodies (Adams 2003). The species is known to roost in abandoned buildings, caves, mine shafts, cliff crevices, and hollow trees (WBWG 2016). Although this species was not detected during baseline acoustic surveys suitable habitat occurs within the project area.

Long-legged Myotis

The long-legged myotis occurs throughout Nevada mainly in montane, and subalpine woodlands, and forests, but can also be observed in shrublands, meadows, and riparian courses and areas over water bodies (Adams 2003). The species is known to roost in abandoned buildings, caves, mine shafts, cliff crevices, and hollow trees (WBWG 2016). Although this species was not detected during baseline acoustic surveys suitable habitat occurs within the project area.

Pallid Bat

The pallid bat occurs throughout Nevada mainly in mountainous areas, intermontane basins, and lowland desert scrub arid deserts and grasslands often near rocky outcrops and water (Adams 2003). The species is known to roost in rock crevices, buildings, rock piles, tree cavities, shallow caves, and abandoned mines (WBWG 2016). Although this species was not detected during baseline acoustic surveys suitable habitat occurs within the project area.

Silver-haired Bat

The silver-haired bat occurs throughout Nevada mainly in forested habitats but has been observed in more open habitats during migration (WBWG 2016). This species may roost in hollow trees, under sloughing bark, in rock crevices, and occasionally under wood piles, in leaf litter, under foundations, and in buildings, mines and caves. Although this species was not detected during baseline acoustic surveys suitable habitat occurs within the project area.

Spotted Bat

The spotted bat occurs throughout Nevada in a diverse array of habitats, including lowland, montane, and subalpine woodlands, forests, shrublands, and meadows, wooded stream courses, and areas over water bodies (Adams 2003). The species is known to roost in cracks, crevices, and caves found high in fractured rock cliffs. (WBWG 2016). Although this species was not detected during baseline acoustic surveys suitable habitat occurs within the project area.

Townsend's Big-eared Bat

The silver-haired bat occurs throughout Nevada mainly in forested habitats but has been observed in more open habitats during migration (WBWG 2016). This species may roost in hollow trees, under sloughing bark, in rock crevices, and occasionally under wood piles, in leaf litter, under foundations, and in buildings, mines and caves. Although this species was not detected during baseline acoustic surveys suitable habitat occurs within the project area.

Western Pipistrelle

The western pipistrelle occurs throughout western and northern Nevada mainly in desert mountain ranges, desert scrub flats, shrub-steppe, rocky canyons, and associated riparian zones, particularly in areas with cliffs (Adams 2003). Potential roosts include crevices in cliffs, rock outcrops, caves, mines, and buildings, and possibly sometimes rodent burrows and spaces under rocks. Night roosts may include sagebrush shrubs (Johnson and Cassidy 1997). Although this species was not detected during baseline acoustic surveys suitable habitat occurs within the project area.

Western Small-footed Myotis

The western small-footed myotis is found throughout Nevada year-round at the middle and higher elevations (1,670-9,055 feet amsl) and occupies a variety of habitats including desert scrub, grasslands, sagebrush steppe, greasewood, piñon-juniper woodlands, pine-fir forests, agricultural lands, and urban areas. This species roosts in caves, mines, and trees and hibernates in areas that are drier and colder than other bat species. A large colony (>100 individuals) was found in an abandoned mine near Eureka, approximately 100 air miles from the Rossi project area. The western small-footed myotis was detected on May 29, 2012 at a rock outcrop in a draw and has been observed north of the study area in the Santa Renia Mountains (SRK 2013b, Bradley et al. 2006).

Yuma Myotis

The Yuma myotis is a year-round resident of Nevada and is more common in the southern and western portions of the state primarily at low to middle elevations (1,475-7,675 feet amsl). This species occurs in a variety of habitats including sagebrush, salt desert scrub, agriculture, playa, and riparian habitats. This species may be more tolerant of human habitats and appears to thrive in relatively urbanized environments. Yuma myotis roosts in buildings, trees, mines, caves, bridges, and rock crevices during the day and in a variety of human-made structures during the night. Yuma myotis was possibly detected acoustically in the study area on May 28, 2012 at two locations associated with wetland features

W-2 and W-3 (**Figure 3.14-4**); however, a positive acoustic determination could not be distinguished between Yuma myotis and California myotis. This species has been documented east of the study area in the Tuscarora Mountains and based on available suitable foraging and marginal roosting habitat it likely occurs within the project area.

Other Mammals

<u>*Pygmy Rabbit*</u>

The pygmy rabbit has a patchy distribution throughout the northern Great Basin and is typically found in areas of tall, dense sagebrush cover. This species is considered a sagebrush obligate species as pygmy rabbits are highly dependent on dense canopied sagebrush to provide both food and shelter throughout the year. Pygmy rabbits usually remain near dense cover and are most abundant in areas with suitable soils for burrowing (75 FR 60516). Field surveys for pygmy rabbit were conducted in the study area between May 21–23 and July 10–11, 2012. No pygmy rabbits or pygmy rabbit sign (e.g., burrows, scat, tracks, dust baths, runways, carcass, etc.) were observed in the study area. Potentially suitable pygmy rabbit habitat is present in the lower elevation drainages in the central portions of the study area. Vegetation within these drainages are typical of the characteristics of pygmy rabbit habitat including very tall, large, and dense big sagebrush shrubs and areas of loamy soil. There are limited areas outside of the draws that provide large robust Wyoming sagebrush (*Artemisia tridentate* ssp. *wyomingensis*) and basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) that could also provide suitable habitat for this species.

3.18.1.3 Birds

Bald Eagle

Bald eagles typically inhabit areas near open water and forage upon fish and waterfowl but may also be observed in areas where roadkill provides foraging opportunity (NDOW 2015a). In Northern Nevada, bald eagles can be found roosting in trees or large sagebrush near valley bottoms and are more commonly found foraging away from areas of open water during the winter in northern Nevada (NDOW 2012b). Although no active bald eagle nests or suitable nesting substrate (large trees near open water) occurs within the project study area, bald eagles are known to forage within the project vicinity during the winter months (NDOW 2017a). This species was not observed in the study area during surveys in spring and summer 2012.

Brewer's Sparrow

The Brewer's sparrow breeds throughout northern Nevada and is found in primarily montane sagebrush and salt desert scrub habitats comprised of sagebrush, greasewood, and perennial upland grasses and prefers areas dominated by shrubs. This species breeds between mid-April and early August and places its nest in the dense crown of a tall shrub (approximately two feet above ground). This species was observed in the study area during surveys in spring and summer 2012.

Ferruginous Hawk

Within the Great Basin, ferruginous hawks typically nest within juniper trees along the edges of woodland habitats adjacent to more open grassland or shrubland habitats. This species also commonly nests upon rock outcrops (Floyd et al. 2007). Ferruginous hawks have been observed to focus foraging efforts on ground squirrels. Because ground squirrels typically enter aestivation by late July or early August, ferruginous hawks typically fledge their young and leave the area by early August (GBBO 2010). This species was not observed in the study area during surveys in spring and summer 2012.

Golden Eagle

The golden eagle is a year-long resident of Nevada with a distribution that is largely restricted to the western portion of the state with some of its highest densities in the shrub-steppe habitats of the Great Basin. This species occurs in a wide variety of habitats throughout Nevada and tends to avoid forests,

large agricultural areas, and urban areas. Limiting factors for golden eagle populations are prey densities and the availability of nest sites near suitable prey populations which include jackrabbits, cottontails, and larger rodents such as ground squirrels. Golden eagles often nest on cliffs, in trees, steep hillsides, or occasionally on the ground and territory sizes are large and a pair may defend an area on average 5,000–8,600 acres in size while breeding (GBBO 2010).

Ground-based surveys were conducted for nesting golden eagles on April 25, May 30, and June 26, 2012; May 9, June 11, and June 24–25, 2014; and April 9 and May 28, 2015. No active golden eagle nests were detected within the study area during surveys in 2012. Thirty-one golden eagle nest sites were monitored within a 10 mile radius of the study area during the most recent survey period in 2015. A summary of the active nests observed within the 10-mile buffer of the study area is provided below in **Table 3.18-1**.

Table 3.18-1. Active Golden Eagle Nests in the Rossi Mine Study Area

Date Observed	Distance from Study Area	Notes
May 9 and June 11, 2014[1]	1 mile west of study area	Observed at mid-level on a cliff face, one eaglet was seen.
May 9 and June 11, 2014[1]	4 miles west of study area	Observed at the lower half of a cliff face, two eaglets were seen.
May 9 and June 11, 2014[1]	10 miles northwest of study area	Observed at mid-level on a cliff face, one eaglet was seen.
May 9 and June 11, 2014[1]	9.5 miles northwest of study area	Observed at mid-level on a cliff face, two eaglets were seen.
April 9 and May 28, 2015[2]	9 miles northwest of study area	Observed 2 nests on a cliff face, one eaglet was seen in the lower nest.
April 9 and May 28, 2015[2]	10.5 miles northwest of study area	Observed a nest on the top of rocks, one broken egg was seen
April 9 and May 28, 2015[2]	9 miles northwest of study area	Observed nest on snow, one eaglet seen.
April 9 and May 28, 2015[2]	4 miles west of study area	Observed two nests on a rock outcrop, one eaglet seen.
April 9 and May 28, 2015[2]	9 miles southwest of study area	Observed one adult incubating three eaglets.
April 9 and May 28, 2015[2]	1 mile west of study area	Observed two nests on a rock outcrop, three chicks seen on the larger of the two nests.
April 9 and May 28, 2015[2]	3 miles west of study area	Observed adult on nest with two eggs.

[1] Source = SRK 2014f.
[2] Source = Stantec 2015.

No active golden eagle nests have been observed within the study area during field surveys; however, this species has a high potential to occur in the study area due to the presence of active nests in areas adjacent to the study area and the availability of suitable foraging habitat.

Greater Sage-grouse

The GRSG current range includes sagebrush habitats in 11 western United States and two Canadian provinces (USFWS 2013). Sagebrush is a key component of GRSG habitat on a year-round basis and is used to provide forage, nesting areas, security, and thermal cover. Dense sagebrush stands that reach above snow levels comprise winter habitat and areas with a significant herbaceous understory are necessary for brood-rearing. In Nevada, GRSG males begin displaying on leks in March and hens typically begin nesting in April and May (USFWS 2013, Neel 1999).

GRSG populations and habitats are currently managed in Nevada by NDOW. The USFWS found that listing the GRSG was not warranted on October 2, 2015 (80 FR 59858). The BLM also applies protective stipulations during critical periods of the life cycle to ensure that activities do not lead to degradation of

habitat or disrupt breeding, nesting, and brood-rearing activities, resulting in a further decline of GRSG numbers. As a result of the March 2010 USFWS finding of "warranted but precluded," the BLM, in coordination with the USFS, developed a landscape-level management strategy to offer the highest protection for GRSG in the most important habitat areas. The BLM Nevada and Northeastern California Greater Sage-Grouse Approved Resource Management Plan Amendment (GRSG Amendment) (BLM 2015a) include GRSG habitat management objectives to avoid and minimize additional disturbance in GRSG management areas and target restoration of and improvements in the most important habitat areas.

Under the GRSG Amendment, habitat management categories have been identified by the BLM in coordination with respective wildlife agencies to help apply management guidelines designed to protect and/or manage GRSG habitat. These habitat management categories are referred to as Priority Habitat Management Areas (PHMA), General Habitat Management Areas (GHMA), and Other Habitat Management Areas (OHMA) (BLM 2015a). The management categories are defined under the GRSG Amendment as follows:

- **PHMA:** BLM-administered lands identified as having the highest value to maintaining sustainable GRSG populations. Areas of PHMA largely coincide with areas identified as priority areas for conservation in the USFWS's Conservation Objectives Team report. These areas include breeding, late brood-rearing, and winter concentration areas and migration or connectivity corridors.
- **GHMA:** BLM-administered lands where some special management will apply to sustain GRSG populations; these are areas of occupied seasonal or year-round habitat outside of PHMA.
- **OHMA:** BLM-administered lands previously identified as unmapped habitat in the Draft GRSG Amendment that are within the planning area and contain seasonal or connectivity habitat areas. These areas also were identified in recent habitat modeling efforts (Coates et al. 2014) as containing characteristics of unmapped but suitable GRSG habitat. No OHMA occurs within the project study area.

The 2015 GRSG Amendment includes habitat management categories as delineated by the August 2014 version of the Coates et al. GRSG habitat model for Nevada (Coates et al. 2014). The BLM has been using this August 2014 habitat map to conduct conservation efforts and NEPA analysis under the direction of the GRSG Amendment. A revision to the August 2014 map was published in March of 2015 to include updated habitat selection modeling, updated lek information, additional major road and urban area information, and a reduction to the extent of the management categories to the Biologically Significant Units (BSU). The Nevada BLM is in the process of adopting the March 2015 habitat category map to replace the August 2014 version. Until the March 2015 map is formally adopted the Nevada BLM is including analysis of both the August 2014 and March 2015 map versions in this EIS. The acreage difference in habitat categories between the August 2014 and March 2015 maps within the Rossi project area is minimal. **Table 3.18-2** summarizes the GRSG habitat management categories for the August 2014 and March 2015 map versions.

Table 3.18-2. Existing Acreage of Greater Sage-grouse Habitat Management Categories within the Rossi Mine Study Area

Habitat Type	August 2014 Map (acres)	March 2015 Map (acres)	Percent Change
PHMA	2,712	2,657	-2%
GHMA	1,019	1,074	+5%
OHMA	-	-	-
Total	**3,731**	**3,731**	**-**

Sources: Coates et al. 2014; Coates et al. 2015.

Under the August 2014 habitat map, there are 2,712 acres of PHMA (73 percent of the study area) within the study area, and 1,019 acres of GHMA (27 percent of the study area) in the study area as presented in

Figure 3.18-2. Under the March 2015 habitat map, there are 2,657 acres of PHMA (71 percent of the study area) within the study area, and 1,074 acres of GHMA (29 percent of the study area) in the study area as presented in **Figure 3.18-3**. No areas of OHMA currently occur within the study area under either the August 2014 or March 2015 habitat maps.

Sagebrush Focal Areas (SFA) are a subset of PHMA and were derived from GRSG stronghold areas described by the USFWS which are strongholds for GRSG and have been noted as having the highest densities of GRSG and other criteria important for the persistence of the species. There are no SFAs within the study area; the closest designated SFA occurs approximately 24 miles to the north of the project area.

Greater Sage-grouse Lekking/Breeding/Nesting Habitat

The center of breeding activity for the GRSG is referred to as a strutting ground or lek. Leks are characterized as flat, sparsely vegetated areas within large tracts of sagebrush (Connelly et al. 2004). Males begin to appear on leks in March, with peak attendance of leks occurring from late-March to mid-April (Connelly et al. 2004). Nesting generally commences 1 to 2 weeks after mating and may continue as late as early June. GRSG nesting habitat typically is centered on active leks and consists of medium to tall sagebrush with a perennial grass understory (Connelly et al. 2000). Studies have shown that taller sagebrush with larger canopies and more residual understory cover usually lead to higher nesting success for this species (Connelly et al. 2004, Connelly et al. 2000).

GRSG population levels are generally cyclic, meaning they experience alternative periods of increases and decreases. GRSG populations in Nevada have displayed a significant downward trend in both numbers and distribution. Nevada counted 8,994 male GRSG in ground counts in 2015 (11 percent of the range-wide total). The number of active leks counted that met the criteria for inclusion in a population trend analysis varied widely between 1965–2015 from a low of 27 leks between 1965 and 1979 to a high of 376 between 2008 and 2015. Historic lek surveys were conducted at a much smaller scale across Nevada prior to 1980 therefore the low number of leks included in population analyses (27) is likely a result of lower sampling effort statewide. The average males per lek have also fluctuated, between about 16 and 27 since 1982 and are approximately 21 average males per lek in 2015 (WAFWA 2015).

Four known leks (Squaw Creek 4, Alkali Spring, North Santa Renia 36SE, and Little Coyote Creek) were identified by NDOW within a 4-mile radius of the study area and were surveyed in 2012 (Table 3.18-3). Field surveys of GRSG lek attendance were conducted on April 3–4, and 25–26, 2012; March 29, April 5 and 11, 2014; March 26 and April 9, 16, and 23, 2015; and April 6 and 20, and May 6 and 11, 2016. Little Coyote Creek lek (approximately one mile northeast of the study area) was the only lek site that was active in 2012; a total of 12 males were observed during the ground surveys, no females were observed. An additional five males were observed at this lek during an April 20, 2012 helicopter survey. No other GRSG activity was observed in the study area during field surveys (SRK 2013b).

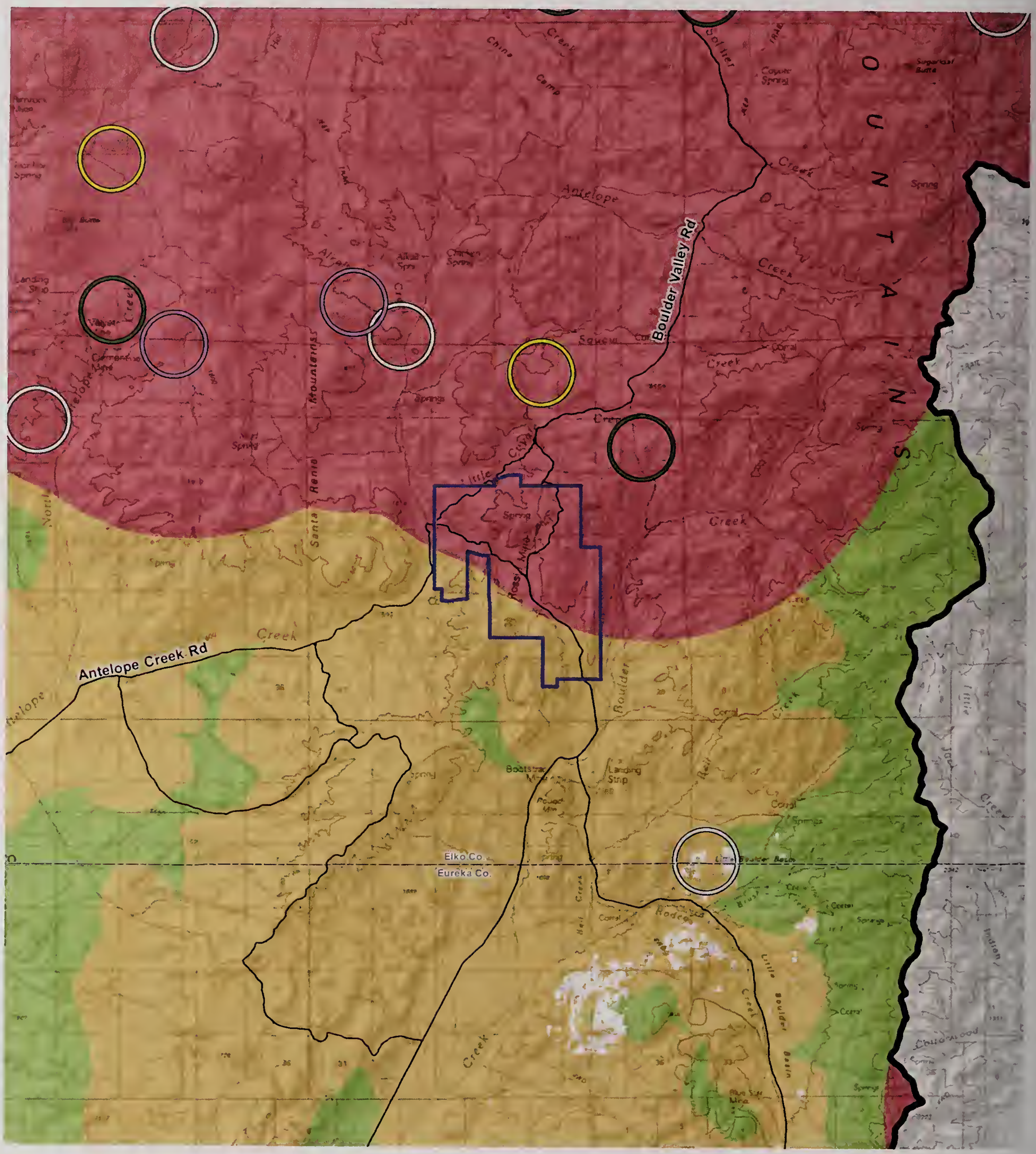
Table 3.18-3. Greater Sage-grouse Leks within 4 Miles of the Rossi Mine Project Area

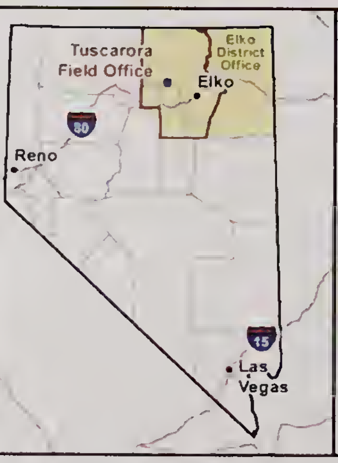
Name	NDOW Lek Status[3]	Distance from Existing Disturbance[1] (miles)	Lek Counts (Maximum Number of Birds[2])		
			2014	*2015*	*2016*
Little Coyote Creek	Active	1.12	7	14	16
North Santa Renia	Unknown	2.40	0	0	0
Alkali Spring	Pending Active	3.14	3	0	0
Squaw Creek	Unknown	1.63	0	0	0

Source: Stantec 2015; HES 2016h.

[1] Existing and/or previously authorized.
[2] Both male and female birds reported.
[3] NDOW lek status is based on number of males observed at lek locations.

"-" indicates the lek was not surveyed.





Project Study Area

Greater Sage-grouse Cumulative Effects Study Area

Area within 1/2 Mile of Greater Sage-grouse Leks (Status)

- Active
- Inactive
- Pending
- Unknown

Greater Sage-grouse Management Categories (2014)

- Priority Habitat Management Area (PHMA)
- General Habitat Management Area (GHMA)
- Other Habitat Management Area (OHMA)

Source: BLM 2015a, BLM 2015g, SRK 2014a, Coates et al. 2014

Rossi Mine Expansion Project EIS

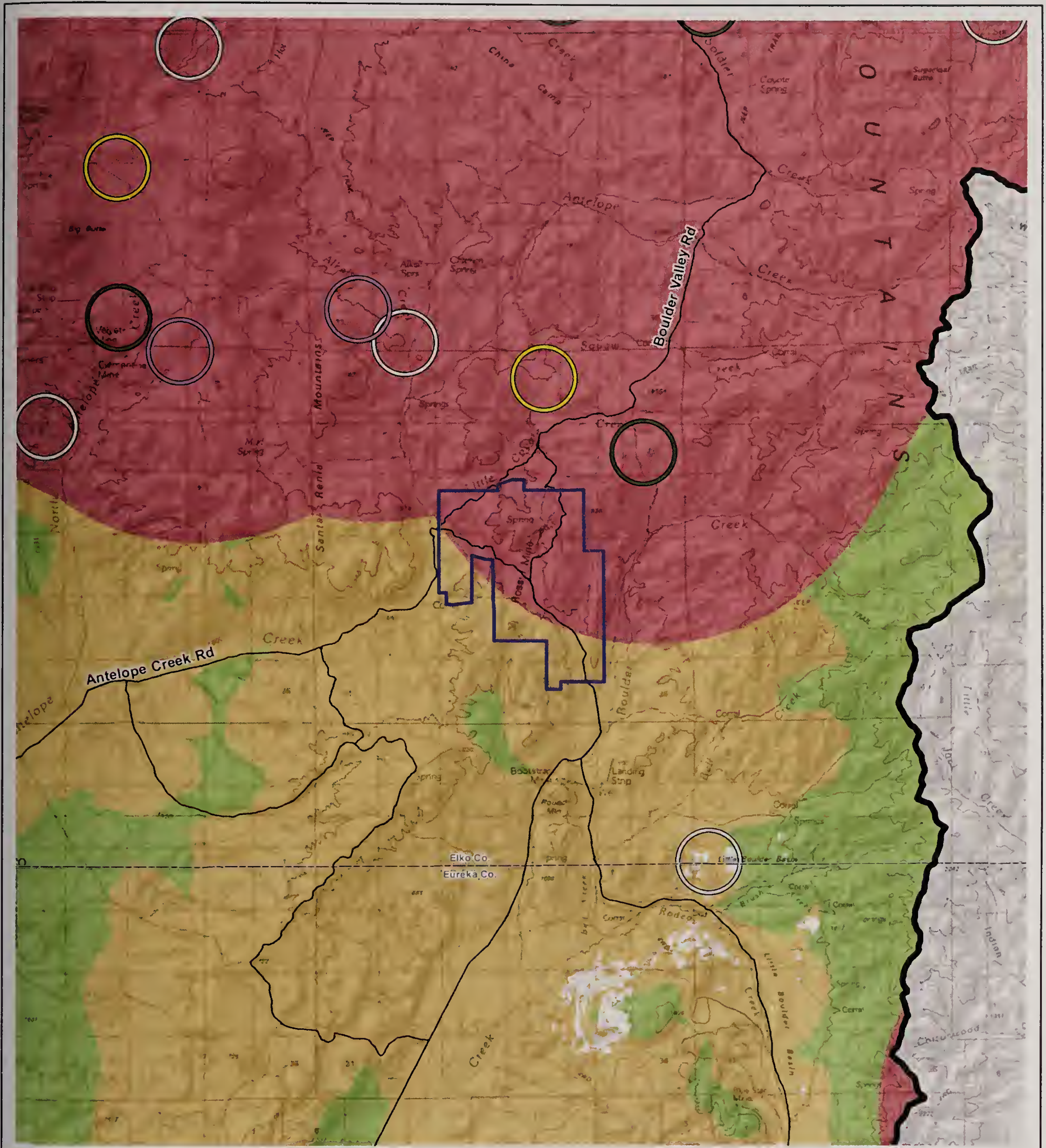
Figure 3.18-2

Greater Sage-grouse Habitat in the Project Study Area

0 1 2 3 Miles
0 1 2 3 Kilometers
1:150,000

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notice.

10/12/2017



Project Study Area

Greater Sage-grouse Cumulative Effects Study Area

Area within 1/2 Mile of Greater Sage-grouse Leks (Status)

Active

Inactive

Pending

Unknown

Greater Sage-grouse Management Categories (2015)

Priority Habitat Management Area (PHMA)

General Habitat Management Area (GHMA)

Other Habitat Management Area (OHMA)

Source: BLM 2015a, BLM 2015g, SRK 2014a, Coates et al. 2015

Rossi Mine Expansion Project EIS

Figure 3.18-3

Greater Sage-grouse Habitat in the Project Study Area

0 1 2 3 Miles

0 1 2 3 Kilometers

1:150,000

10/12/2017

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data
Original data were compiled from various sources. This information may not meet National Map Accuracy Standards
This product was developed through digital means and may be updated without notice.

The Little Coyote Creek lek was also the only lek site that was active during surveys in 2014, 2015, and 2016. Four males were observed on April 4, 2014, no females were observed (SRK 2014f). A total of 22 males, two females, and 14 unknown sex of GRSG were observed during the survey period in 2015 (Stantec 2015). A total of 54 males, 3 females, and one unknown sex of GRSG were observed during the survey period in 2016 (HES 2016h).

Greater Sage-grouse Seasonal Habitat

In addition to BLM Habitat Management Categories presented above, NDOW has recently delineated seasonal habitats for GRSG within the study area. The results of the seasonal habitat delineation are presented in **Figure 3.18-4**. Seasonal GRSG habitats include lekking/breeding habitat, nesting habitat, late-brood rearing habitat, and winter habitats. A total of 1,893 acres of nesting habitat, 2,516 acres of brood-rearing habitat, and 2,516 acres of winter habitat occur within the study area (**Figure 3.18-4**).

Greater Sage-grouse Response to Noise

Ambient sound plays a central role in GRSG breeding behavior. Male GRSG select leks that are highly visible and have good acoustic propagation characteristics (Braun et al. 2002, Dantzker et al. 1999), relatively free of tall vegetation or ground cover. The male mating display sequence consists of a cooing pattern with highly directional sound energy in the range of 300–600 Hertz (Hz), followed by popping and whistling sounds in the range of 600–3200 Hz. Sounds produced by a lekking male allow females to locate leks and select mating partners among displaying males (Blickley et al. 2012). Sound is normally defined as “vibrations that travel through the air or another medium and can be heard when they reach a person’s or animal’s ear” (Stevenson and Lindberg 2010). These vibrations have both a frequency and an amplitude, with frequency measured in Hertz and heard by humans across a range from about 20 to 20,000 Hertz (Ambrose and Florian 2014). Although the range of perceptible frequencies likely varies by species, most animals can perceive sound across a wide range of frequencies. Amplitude is perceived as the loudness of sound, and is commonly measured in decibels (dB), a logarithmic unit for quantifying the intensity of sound. Due to the fact that sound is measured on a logarithmic scale, it is difficult to interpret dB levels naturally because of the nonlinear relationship of the scale of measure. For example purposes, a sound measured at 20 dB above the ambient conditions observed at the edge of a GRSG lek produces a 10 fold increase in the sound pressure and a four-fold increase of the perceived loudness of the noise. A complete review of anthropogenic sound and the resulting impacts to GRSG in Nevada is provided in the NDOW publication *Acoustic Impacts and Sage-grouse: A Review of Current Science, Sound Measurement Protocols, and Management Recommendations* (Tull 2015).

Noise guidelines in the GRSG Amendment (BLM 2015a) limit noise from discretionary activities (e.g., during construction, operation, and maintenance) to not exceed 10 dB, on the A-weighted scale (dBA), above ambient sound levels at least 0.25 mile from active and pending leks, from two hours before to two hours after sunrise and sunset during the breeding season.

Ambient noise data was collected at the four leks described above between April 17 and 23, 2015. The L_{90} noise metric represents the sound level measured over each 1-hour measurement interval exceeded 90 percent of the time. One can think of L_{90} measures as a common or nearly persistent level of sound pressure for a given location, therefore measures at L_{90} are often used to determine “background noise,” or baseline sound (Tull 2015). Minimum L_{90} values for all monitoring sites between 5:00 am and 10:00 am were in the range of 16.3 to 20.2 dBA L_{90}, and maximum values were in the range of 20.2 to 24.2 dBA L_{90}. The average ambient noise levels are provided in **Table 3.18-4** below (Brennan and Associates 2015).

Project Study Area

Greater Sage-grouse Seasonal Habitat

Lek Habitat

Nesting Habitat

Brood-rearing Habitat

Riparian Habitat

Winter Habitat

Source: NDOW 2016c, SRK 2014a.

Rossi Mine Expansion Project EIS

Figure 3.18-4

Greater Sage-grouse Seasonal Habitat within the Study Area

0 1 2 Miles

0 1 2 Kilometers

1:100,000

11/13/2017

Table 3.18-4. Summary of Ambient Noise during Lek Activity at 4 Leks near the Rossi Mine Study Area

Lek Name	Distance from Study Area (miles)	Average L_{90} Noise Levels
Alkali Springs Lek	3.1	18.9
North Santa Renia Lek	2.4	17.6
Squaw Creek 3 Lek	1.6	17.9
Little Coyote Creek 12 Lek	1.1	20.1
Overall Average		**18.6**

Source: Brennan and Associates 2015.

The overall average L_{90} at lek perimeter location between the hours of 5:00 am and 10:00 am is 18.6 dBA L_{90}. For the purposes of analysis, and consistent with the GRSG Amendment, an ambient noise level of 18.6 dBA is used to characterize ambient noise level at the perimeter of lek locations in the vicinity of the Rossi Mine proposed project.

Loggerhead Shrike

The loggerhead shrike is a resident in Nevada and is found in open country with scattered trees and shrubs, savanna, desert scrub, and occasionally in open woodland (Wildlife Action Plan Team 2012). Loggerhead shrikes prefer shrubs or small trees for nesting, but nesting can also occur in piñon-juniper woodlands (Neel 1999). This species can often be found perching on wire, fences, or poles and the breeding season occurs between April 15 and July 15. This species was observed in the study area during surveys in spring and summer 2012.

Sage Thrasher

Sage thrasher is a sagebrush obligate commonly found within intact stands of dense sagebrush but has also been observed to occur in greasewood or bitterbrush vegetation communities (Floyd et al. 2007). Sage thrashers commonly build nests on the ground or within patches of dense vegetation. Foraging sage thrashers focus upon insects but may also use berries as a food source when available. This species was observed in the study area during surveys in spring and summer 2012.

Swainson's Hawk

Within the Great Basin, Swainson's hawks occur within sagebrush, grassland, and pinyon-juniper woodland habitats but can also be found in agricultural areas (GBBO 2010). Swainson's hawks typically nest in large riparian trees or in isolated trees found near ranches. Foraging Swainson's hawks focus upon vertebrate mammals including ground squirrels and pocket gophers, but have been observed to opportunistically consume insects including crickets and grasshoppers when available. This species was not observed in the study area during surveys in spring and summer 2012.

Western Burrowing Owl

The western burrowing owl is a small ground-dwelling owl with long legs, white chin stripe, round head, and stubby tail (Wildlife Action Plan Team 2012). It often nests in burrows that have been abandoned by other burrowing mammals and usually in open areas with good surrounding visibility. Western burrowing owls are present in northern Nevada in the spring and summer months and winter in the southwestern states (GBBO 2010). Although this species was not observed during baseline surveys, suitable habitat occurs within the project area. No ground squirrel colonies were observed within the study area during baseline surveys. Burrowing owls often prey upon ground squirrels and active colonies are associated with burrowing owl activity.

3.18.2 Environmental Consequences

Issues related to special-status species would include the loss or alteration of native habitats, increased habitat fragmentation, animal displacement, and direct loss of wildlife. Potential impacts for the eleven special-status species identified as documented or potentially occurring within the study area are discussed below.

The potential impacts of the proposed project on special-status wildlife can be classified as short-term (temporary) and long-term in duration. Short-term impacts result from habitat disturbance and removal due to construction and from activities associated with mine operation and occur during the active life of the mine and until reclamation is successfully completed. Short term impacts would cease upon mine closure and completion of successful reclamation. Long-term impacts include permanent changes to habitats and the wildlife and aquatic populations that depend on those habitats, regardless of reclamation success. Permanent impact acreages are a result of those open pit areas that would not be backfilled or reclaimed as discussed in Section 2.3.5, Open Pits.

Impacts to habitat can further be categorized as direct and indirect. Direct habitat impact results when habitat is destroyed or converted to a form that is unusable by the affected species, and is typically long-term. The primary potential indirect impact of the proposed project is wildlife avoidance (displacement) of otherwise suitable habitat in the project area, even when the habitat is relatively undisturbed by the project. Indirect impacts are more difficult to quantify than direct impacts because for most wildlife species there is limited scientific data available describing thresholds. Habitat loss and/or displacement impacts also may result in the fragmentation of habitat in to smaller sized areas.

3.18.2.1 Proposed Action

Surface Disturbance

The proposed project would result in the short-term surface disturbance of 973 acres (approximately 26 percent of the project area) and long-term reduction of 194 acres (approximately 5 percent of the project area) of wildlife habitat. Of the 973 acres of short-term surface disturbance, approximately 67 acres would result from ongoing exploration activities within the project area. Permanent impacts would include approximately 53 acres of Mixed Mountain and Low Sagebrush, 23 acres of Mixed Black, Wyoming and Mountain Sagebrush, 6 acres of Mixed Wyoming and Mountain Sagebrush, 16 acres of annual grassland, and 95 acres of previously disturbed areas. Disturbance associated with the Proposed Action would be reclaimed, with the exception of 194 acres of expanding and new open pits which would not be back-filled or reclaimed. Both short-term and permanent loss of suitable habitat is a significant impact to special-status species within the project area.

Similar to impacts discussed in Section 3.17.2, Environmental Consequences, impacts to special-status species from mine-related surface disturbance would include the short-term (temporary) and long-term (permanent) reduction or loss of habitat. Habitat loss or alteration would result in direct losses of smaller, less mobile species of wildlife, such as pygmy rabbit, and the displacement of more mobile species (e.g., bats, birds) into adjacent habitats. Mine-related surface disturbance would result in an incremental increase in habitat fragmentation at the mine site until reclamation is concluded and vegetation has been re-established. Potential impacts to special-status species resulting from mine-related displacement and habitat fragmentation would be highest for sagebrush-obligate species.

All new power distribution lines under the Proposed Action would be buried underground within the disturbance footprint of existing or proposed access and secondary roads. Therefore impacts to wildlife from the power distribution system would remain the same as under the No Action Alternative with the exception of indirect impacts from human presence and noise during construction and maintenance activities.

Under the Proposed Action, exploration would continue throughout the project area as described in Section 2.3.10, Exploration. Direct impacts to special-status wildlife species from exploration would include short-term loss of approximately 67 acres of potentially suitable habitat. Indirect impacts resulting from exploration activities would include increased human presence and noise during road and pad construction and active drilling operations. Exploration activity would also result in increased fugitive dust

and short-term habitat fragmentation. Exploratory drilling may occur at any time within the PoO, including drilling and other activity during daylight and at night. Impacts to special-status species from exploration activity during low-light and after dark conditions could include displacement, disorientation, and disturbance of roosting or resting individuals resulting from the use of temporary lighting to illuminate drilling pads, exploration roads, and other work areas. Exploration vehicles and equipment working after dark may impact nocturnal wildlife through collisions on exploration roads or drilling pads potentially resulting in mortality of individuals.

Exploration activities located within 3.1 miles of active GRSG leks would be subject to timing and noise restrictions during the spring breeding and brood rearing season. These restrictions would affect the northeastern sections of the proposed PoO area, as shown in **Figure A-2** of **Appendix A**. Although exploration activities within the project area are subject to seasonal timing restrictions for GRSG breeding habitat, exploration activities would result in an increase of human presence and noise outside of these sensitive periods.

Reclamation of mining disturbance and removal of mining support and ancillary facilities would occur as presented in Section 2.3.12, Closure and Reclamation Plan. Impacts of reclamation and removal of mining facilities would be similar to impacts resulting from mine construction and operation, including the presence of vehicles, equipment, and reclamation staff within the PoO boundary. During reclamation, increased dust, vibration, and noise would result in increased temporary disturbance in the areas where reclamation is actively being implemented. Periodic monitoring of reclamation success would result in the presence of reclamation staff, vehicles, and equipment within the PoO boundary.

Proposed Communication Site

The installation of the proposed communications tower would result in temporary impacts from the presence of construction equipment and personnel at the communication site and the removal of approximately 0.009 acres of vegetation as discussed in Section 2.3.9.11, Communication Tower Site. During the life of the mine, the communications tower may result in adverse impacts to avian species that could collide with the tower. The communication tower would not include guy wires or night time lighting therefore the risk of collision to avian species is considered to be minimal. The communication tower would provide an elevated perching location for predatory raptor and corvid [common raven (*Corvus corax*) or common crow (*Corvus brachyrhynchos*) species and which could result in increased predation of terrestrial prey species, including GRSG, within the immediate area around the tower and the viewshed of a perching raptor or corvid.

<u>*Mammals*</u>

Bats

Of the fifteen bat species that could occur in the study area, five (Brazilian free-tailed bat, California myotis, little brown myotis, western small-footed myotis, and Yuma myotis) have been documented within the project area (SRK 2013a, Bradley et al. 2006). Implementation of the Proposed Action could result in direct and indirect impacts to local bat species and their habitat, especially when disturbance occurs in grasslands, riparian, wetland, and shrubland foraging habitats. Direct impacts would include loss of foraging and roosting habitat, mortalities due to vehicular traffic collisions, and potential for exposure to hazardous chemicals in the event of an accidental release.

Indirect impacts associated with mining operations include mining and exploration related noise, human presence, and the use of artificial lighting currently occurring at the mine site. These impacts would continue and are anticipated to increase under the proposed project. Some bat species are especially sensitive to disturbance during roosting and can abandon sites due to increased human presence. Project-related noise from construction, vehicle traffic, and increased human activity could adversely affect these species. The use of artificial lighting during night time operations could adversely impact foraging bats. Under the Proposed Action, HES would implement BMPs outlined in the HES Lighting Management Plan (HES 2016j) to avoid and minimize the potential impact of artificial lighting on foraging bats within the project area. These measures include the use of shielding and cages on all fixed and mobile light sources within the project area to reduce light pollution that could disorient foraging bats.

Potential roost sites for these bat species include cliff faces, rock outcrops, trees, and buildings, although no trees are present in the project area. Existing cliff faces, rock outcrops, and buildings that may provide roosting habitat within the project area are limited in abundance, and those that are present, likely would not be disturbed by mine-related construction under the Proposed Action; however, the level of development near these habitats may cause animal displacement or aversion to use of the habitats. Due to the limited availability of roosting habitats within the study area, project construction would not result in population-level impacts to sensitive bat species.

Pygmy Rabbit

Implementation of the proposed project would result in the short-term reduction of 788 acres of sagebrush dominated habitat and the long-term reduction of approximately 82 acres of potentially suitable sagebrush habitat (sagebrush-dominated habitats) for this species, until final reclamation is deemed complete and vegetation is re-established. No pygmy rabbits were observed during surveys conducted in the study area; however, potential suitable pygmy rabbit habitat is present in the study area. The Proposed Action could result in direct and indirect impacts similar to those described for mammals in Section 3.17.2.1, Proposed Action, including potential mortalities of pygmy rabbits. Project construction could result in several indirect impacts on pygmy rabbit and their habitat including decreased total amount of suitable habitat and decreased quality of habitat following reclamation due to the prolonged time required to establish high quality, mature sagebrush habitat with vertical and horizontal structural diversity and the increased likelihood for the establishment and spread of non-native invasive species and noxious weeds. Human activity and noise associated with construction of the Proposed Action and exploration could result in increased avoidance and displacement of animals or groups of individuals from areas with lighting, vibration, noise, dust, or human presence. These impacts would be moderate, considering the limited availability of high density sagebrush stands characteristic of quality pygmy rabbit habitat that is not currently impacted by existing disturbance. The loss of individual pygmy rabbits would not result in population-level impacts. Although no evidence of pygmy rabbits was observed during field surveys, suitable habitat does exist within the study area and those areas removed by mining activity would be a substantial impact. Proposed mitigation measure **SSS-1** presented in Section 3.18.4, Potential Monitoring and Mitigation Measures, would require HES to conduct clearance surveys of pygmy rabbit habitat prior to surface disturbing activities or removal of suitable habitat in order to ensure that potential impacts to the species are avoided and minimized to the extent practicable.

<u>Birds</u>

Implementation of the Proposed Action could result in direct and indirect impacts to avian species and their habitat, especially if disturbance occurs in grasslands, riparian, wetland, and shrubland foraging habitat. Potential direct impacts would include mortalities due to vehicular traffic collisions, exposure to hazardous chemicals, and loss of suitable habitat during the life of the mine. These direct adverse impacts to sensitive raptors and migratory bird species associated with the construction and operation of the proposed project would be minimized due to the implementation of Applicant Committed Environmental Protection Measures presented in **Table 2-16**. Additional species-specific impacts are discussed below.

Bald Eagle

Although no bald eagle nests or nesting substrate occurs within the study area and this species was not observed during baseline surveys, individuals could occur while opportunistically foraging for roadkill or passing through the study area. Direct impacts would include the short-term reduction of 973 acres of potential foraging habitat until final reclamation is completed and vegetation re-established and a long-term reduction of 194 acres. Indirect impacts associated with mine-related noise and human presence currently occur at the site and would increase under the proposed project.

Additional indirect impacts to bald eagles would be similar to those discussed for raptor species in Section 3.17.2.1, Proposed Action, sub-section, Migratory Birds and Raptors. Potential impacts to this species as a result of the proposed project are considered low due to the implementation of eagle-specific Applicant Committed Environmental Protection Measures, the lack of active nest sites within the study area, the current level of activity at the mine site, and low potential for impacts to the prey base in the study area.

Brewer's Sparrow

Direct impacts to Brewer's sparrow would include the short-term reduction of 788 acres of sagebrush dominated habitat and the long-term reduction of approximately 82 acres of big sagebrush dominated habitat which comprises potential breeding and foraging habitat for this species until reclamation was completed and vegetation was re-established. Indirect impacts associated with mine-related noise and human presence currently occur at the site and would increase under the proposed project. Additional indirect impacts would be similar to those discussed in Section 3.17.2.1, Proposed Action, sub-section, Migratory Birds and Raptors. Potential impacts to this species as a result of the proposed project are considered low due to the implementation of Applicant Committed Environmental Protection Measures, the overall availability of suitable habitat in the vicinity of the project, and the current level of activity at the mine site.

Ferruginous Hawk

Although no ferruginous hawk nests were identified within the study area and this species was not observed during baseline surveys, individuals could occur while foraging or passing through the study area. Direct impacts would include the short-term reduction of 973 acres of potential foraging habitat until final reclamation is completed and vegetation re-established and a long-term reduction of 194 acres. Indirect impacts associated with mine-related noise and human presence currently occur at the site and would increase under the proposed project.

Additional indirect impacts to ferruginous hawks would be similar to those discussed for raptor species in Section 3.17.2.1, Proposed Action, sub-section, Migratory Birds and Raptors. Potential impacts to this species as a result of the proposed project are considered low due to the implementation of eagle-specific Applicant Committed Environmental Protection Measures, the lack of active nest sites within the study area, the current level of activity at the mine site, and low potential for impacts to the prey base in the study area.

Golden Eagle

No active golden eagle nests have been identified within the study area; however, golden eagles were observed during surveys within the study area. Direct impacts would include the short-term reduction of 973 acres of potential foraging habitat until final reclamation is completed and vegetation re-established and a long-term reduction of 194 acres. Indirect impacts associated with mine-related noise and human presence currently occur at the site and would increase under the proposed project. There are two active golden eagle nests approximately one mile west of the study area; golden eagles occupying these nest sites would be most likely to experience indirect impacts as a result of noise and human activity associated with the proposed project; however, these impacts would be reduced as the nests are not in the direct line of sight of the study area due to existing topography.

Additional indirect impacts on golden eagle would be similar to those discussed for raptor species in Section 3.17.2.1, Proposed Action, sub-section, Migratory Birds and Raptors. Potential impacts to this species as a result of the proposed project are considered low due to the implementation of eagle-specific Applicant Committed Environmental Protection Measures, the lack of active nest sites within the study area, the current level of activity at the mine site, and low potential for impacts to the prey base in the study area.

Greater Sage-grouse

The nearest recently active lek, the Little Coyote Creek lek, occurs approximately one mile to the northeast of the study area. The Alkali Spring lek has a pending status and occurs approximately 3 miles north of the study area. These active and potentially active leks are within 4 miles of potential surface disturbance within the study area. As a result, direct impacts to breeding GRSG would not be anticipated from the proposed project; however, indirect impacts to nesting GRSG could occur. These indirect impacts would be reduced as the leks are not within the direct line of sight of the study area due to existing topography.

Impacts to GRSG habitat are anticipated to occur as a result of disturbance to sagebrush habitat within the study area in association with the development of the proposed project. **Table 3.18-5** presents the

acreage of surface disturbance that would occur under the Proposed Action to GRSG habitat management categories PHMA and GHMA. The anticipated impacts under the August 2014 and March 2015 GRSG habitat maps are included in **Table 3.18-5**.

Direct impacts would include the incremental removal of sagebrush habitat that may potentially provide nesting, early brood, late summer, and winter habitat. This habitat would be incrementally lost as a result of the development of the proposed project and is a significant impact to GRSG habitat within the project area.

Under the Proposed Action, 679 acres of PHMA and 294 acres of GHMA would be disturbed by the short term impacts of mine construction and operation using the 2014 habitat management categories. These acres of disturbance would be reclaimed at the completion of mining activity. In addition, 125 acres of PHMA and 69 acres of GHMA (2014 management categories) would be permanently removed under the Proposed Action as a result of the open pits that would not be backfilled or reclaimed.

Under the Proposed Action, 689 acres of PHMA and 284 acres of GHMA would be disturbed by the short term impacts of mine construction and operation using the 2015 habitat management categories. These acres of disturbance would be reclaimed at the completion of mining activity. In addition, 133 acres of PHMA and 61 acres of GHMA (2015 management categories) would be permanently removed under the Proposed Action as a result of the open pits that would not be backfilled or reclaimed.

Table 3.18-5. Summary of Greater Sage-grouse Habitat Proposed Action Impact Acreages

Habitat Category	Existing Acreage within Study Area[1]	Proposed Action Temporary Impact[1] (acres)	Proposed Action Permanent Impact[1] (acres)	Proposed Action Impact Total (acres)[1]
2014 Habitat Management Categories				
PHMA	2,712	679	125	804
GHMA	1,019	294	69	363
OHMA	-	-	-	-
2014 Habitat Total	**3,731**	**973**	**194**	**1,167**
2015 Habitat Management Categories				
PHMA	2,657	689	133	822
GHMA	1,074	284	61	345
OHMA	-	-	-	-
2015 Habitat Total	**3,731**	**973**	**194**	**1,167**

[1] Numbers have been rounded to the nearest integer, totals may vary due to rounding.

Indirect impacts associated with mine-related noise currently occur at the site and would increase under the proposed project. Heavy equipment associated with construction of the Proposed Action would generate noise above ambient levels in the surrounding area. There are no federal, State of Nevada, or Elko County noise regulations for mining activity; however, noise guidelines in the GRSG Amendment stipulate that noise during construction, operation, and maintenance should not exceed 10 dBA above ambient levels as a relative criterion, to evaluate project-related noise. All of the active leks within four miles of the project area are located to the north of the existing and proposed mine facilities. Locations of these leks are generally in the lower elevations of the Squaw Creek and Alkali Creek drainages where the topography is flat and open. Between the lek locations and the existing and proposed mining facilities are multiple unnamed ridges and small land forms that screen each lek location from mining activity. Due to this existing topography between active leks and mining activity it is likely that impacts from noise and light generated during operational periods is significantly reduced.

HES commissioned a noise modeling study to characterize the anticipated noise levels at the perimeter of the Little Coyote Creek 12 lek located approximately 1.1 miles from the existing Rossi Mine PoO boundary (AECOM 2017a). Although existing topography located between the northern end of the Rossi Mine and the lek obscures the direct line of sight, noise emitted from the Rossi Mine during mining operations could potentially impact individual birds on the lek during the active breeding season.

Complete results of noise modeling for the project are presented in **Appendix I** of this EIS. Noise modeling considered multiple scenarios which included various atmospheric conditions and mine activity levels representative of potential circumstances at the Rossi Mine under both the Proposed Action and the Reconfiguration Alternative. In summary, the results of project noise modeling concluded that under typical atmospheric conditions (temperature, relative humidity, wind direction and speed) and proposed mine activity levels, increases of noise levels experienced by GRSG at the Little Coyote Creek 12 lek would not exceed greater than 10 dBA during a majority of scenarios. Noise modeling did identify some limited scenarios where noise exceedances of 10 dBA could be experienced at the Little Coyote Creek 12 lek (**Appendix I, Table I-2**). In most of these scenarios, the Little Coyote Creek 12 lek is located downwind from the project area, allowing for sound emissions to travel farther before attenuating to ambient levels. As identified in the noise modeling final report, the probability for downwind conditions to exist during the period when GRSG are actively strutting at the Little Coyote Creek 12 lek (two hours before sunrise until two hours after sunrise between March 15 and May 31) and for noise emissions to exceed greater than 10 dBA is considered to be low (less than 5 percent). In addition, modeling results under these downwind conditions did not take into account the likelihood that the ambient noise levels experienced by GRSG at the Little Coyote Creek 12 lek would likely increase due to the noise created by wind moving across local topography and vegetation at the lek site. When this factor is included in noise emission scenarios, the potential for noise levels experienced by GRSG at the Little Coyote Creek 12 lek to exceed 10 dBA above ambient conditions is further reduced. Given that modeling of noise levels at the Rossi Mine are anticipated to result in a low probability of proposed project noise level exceedances of greater than 10 dBA above ambient conditions at the Little Coyote Creek 12 lek, no additional mitigation measures for noise emissions are proposed under the Reconfiguration Alternative.

Based on existing guidance and ambient noise monitoring at the leks, 28.6 dBA L_{90} is used as the noise threshold level where exceedances would result in an adverse impact on GRSG, the primary sensitive noise receptor in the project area. Noise levels exceeding 28.6 dBA L_{90} at nearby leks could result in increased disruption of life-history requirements including male GRSG avoidance of suitable leks during the breeding season (Blickley et al. 2002).

Additional indirect impacts could include increased avoidance by, displacement of, and disruption of life-history requirements of GRSG individuals or groups from suitable habitat proximate to development due to lighting, vibration, noise, dust, or human presence. The proposed project could also result in GRSG avoiding suitable habitat in the study area if they perceive that they are at risk from predation. Increased habitat fragmentation could result in barriers to movement by GRSG to preferred habitat areas which could lead to diminished health of this species. Surface disturbance associated with the proposed project could also result in decreased quantity of insect species which GRSG consume during spring and summer months.

Under the Proposed Action, the construction of new haul roads would disturb approximately 42 acres in the study area. GRSG may be more sensitive to traffic increases than other wildlife species. Male GRSG lek attendance was shown to decline within 1.9 miles of a haul road with traffic exceeding one vehicle per day (Johnson et al. 2011). Female hens that bred on leks within 1.9 miles of roads associated with oil and gas development traveled twice as far to nest as did hens that bred on leks greater than 1.9 miles from roads, resulting in indirect impacts on GRSG health and ultimately mating productivity.

Transmission line structures also can impact GRSG populations by enhancing local raptor and corvid populations. Common corvids species in northern Nevada that may prey upon GRSG nests include the common raven (*Corvus corax*) and the black-billed magpie (*Pica hudsonia*). Raptors and corvids nest and perch on transmission structures, which create vertical structure in generally treeless shrub-steppe habitats (Knight and Kawashima 1993; Steenhof et al. 1993). Raptors and corvids may then occur at higher densities than normal due to increased nesting locations and perches (Steenhof et al. 1993). GRSG and other prairie gallinaceous (ground feeding) birds have evolved in habitat largely devoid of tall

structures. Although it is unclear how these species react to different structure heights, pellet transects have reported declining habitat use by GRSG up to 600 meters from power lines (Braun 1998). Recent research in southern Wyoming has reported GRSG avoidance of brood–rearing habitats within 2.9 miles of transmission lines (LeBeau 2012). Knick et al. (2013) observed increased lek activity and persistence in areas of GRSG habitat characterized as having lower densities of transmission lines in comparison to GRSG habitats with increased densities of transmission lines and infrastructure. All new power distribution lines under the Proposed Action would be buried underground within the disturbance footprint of existing or proposed access and secondary roads. Therefore impacts to GRSG from the power distribution system would remain the same as under the No Action Alternative with the exception of indirect impacts from human presence and noise during construction and maintenance activities.

Potential impacts to this species as a result of the proposed project would be considered moderate due to the current level of activity at the mine site, and the absence of any active leks within the study area.

Loggerhead Shrike

Loggerhead shrike was detected during breeding bird surveys at the study area and there is suitable breeding habitat available for this species. Direct impacts to loggerhead shrike would include short-term reduction of 973 acres of potential breeding and foraging habitat until reclamation was completed and vegetation re-established and a long-term reduction of 194 acres as a result of the open pits that would not be backfilled or reclaimed. Indirect impacts associated with mine-related noise and human presence currently occur at the site and would increase under the proposed project. Additional indirect impacts would be similar to those discussed in Section 3.17.2.1, Proposed Action, sub-section, Migratory Birds and Raptors. Potential impacts to this species as a result of the proposed project are considered low due to the implementation of Applicant Committed Environmental Protection Measures, the overall availability of suitable habitat in the vicinity of the project, and the current level of activity at the mine site.

Sage Thrasher

Sage thrasher was not detected during breeding bird surveys at the study area and there is suitable breeding habitat available for this species. Direct impacts to sage thrasher would include short-term reduction of 973 acres of potential breeding and foraging habitat until reclamation was completed and vegetation re-established and a long-term reduction of 194 acres as a result of the open pits that would not be backfilled or reclaimed. Indirect impacts associated with mine-related noise and human presence currently occur at the site and would increase under the proposed project. Additional indirect impacts would be similar to those discussed in Section 3.17.2.1, Proposed Action, sub-section, Migratory Birds and Raptors. Potential impacts to this species as a result of the proposed project are considered low due to the implementation of Applicant Committed Environmental Protection Measures, the overall availability of suitable habitat in the vicinity of the project, and the current level of activity at the mine site.

Swainson's Hawk

Although no Swainson's hawk nests were identified within the study area and this species was not observed during baseline surveys, individuals could occur while foraging or passing through the study area. Direct impacts would include the short-term reduction of 973 acres of potential foraging habitat until final reclamation is completed and vegetation re-established and a long-term reduction of 194 acres as a result of the open pits that would not be backfilled or reclaimed. Indirect impacts associated with mine-related noise and human presence currently occur at the site and would increase under the proposed project.

Additional indirect impacts on Swainson's hawk would be similar to those discussed for raptor species in Section 3.17.2.1, Proposed Action, sub-section Migratory Birds and Raptors. Potential impacts to this species as a result of the proposed project are considered low due to the implementation of eagle-specific Applicant Committed Environmental Protection Measures, the lack of active nest sites within the study area, the current level of activity at the mine site, and low potential for impacts to the prey base in the study area.

Western Burrowing Owl

Although no burrowing owl nest locations or preferred foraging areas containing ground squirrel colonies were observed during baseline studies, this species may occur within the study area during the spring and summer months. Direct impacts to western burrowing owl would include short-term reduction of 973 acres of potential breeding and foraging habitat until reclamation was completed and vegetation re-established and a long-term reduction of 194 acres as a result of the open pits that would not be backfilled or reclaimed. Indirect impacts associated with mine-related noise and human presence currently occur at the site and would increase under the proposed project. Additional indirect impacts would be similar to those discussed in Section 3.17.2.1, Proposed Action, sub-section, Migratory Birds and Raptors. Potential impacts to this species as a result of the proposed project are considered low due to the implementation of Applicant Committed Environmental Protection Measures, the overall availability of suitable habitat in the vicinity of the project, and the current level of activity at the mine site.

Human Presence and Noise

Impacts to special-status species would parallel those discussed in Section 3.17.2.1, Proposed Action.

Water Quantity and Quality

As discussed in Section 3.4.2.1, Proposed Action, groundwater data suggest that there is a potential for groundwater to be intercepted in the proposed expansion of the King Pit and QLC Pit resulting in the formation of a pit lake. Based on the available data, and recognizing that the water levels in the area of the west lobe of the King Pit are uncertain, there may be potential for groundwater flow to be encountered in the west lobe of the King Pit. Depending on the inflow rates, groundwater inflows combined with runoff from pit walls and direct precipitation there may be potential to result in sufficient flow for development of pit lakes in the west lobe of the King Pit and the QLC Pit. If pit lakes were to develop as a result of mining activity under the Proposed Action, the potential for adverse effect to special-status wildlife may occur. Areas of open water occur infrequently in the project area and it is likely that special-status wildlife could attempt to utilize pit lake areas for drinking, thermal regulation, or other uses. Potential monitoring and mitigation measures for water resources discussed in Section 3.4.4, Potential Monitoring and Mitigation Measures, present a set of measures for monitoring of the potential for pit lakes to develop, evaluation of water quality of pit lakes that may occur, and mitigation measures to reduce or eliminate adverse effects to terrestrial and avian special-status wildlife species. Specific mitigation measures that could be implemented to eliminate or reduce the potential for special-status wildlife species to be adversely affected could include 1) reduction in the depth of open pit mining or partial pit backfilling to preclude pit lake development; 2) utilizing treatment options such as adding amendments to modify pit lake water quality concentrations; 3) measures designed to reduce exposure pathways or receptor access (wildlife fencing, avian deterrents, or other) and 4) other appropriate measures as approved by the BLM, NDOW, and NDEP.

Hazardous Materials Spill

Impacts to special-status species would parallel those discussed in Section 3.17.2.1, Proposed Action.

3.18.2.2 Reconfiguration Alternative

Surface Disturbance

Impacts to special-status species under the Reconfiguration Alternative would be the same as described for the Proposed Action, except that the sequencing of construction of the reconfigured Dawn WRDF would be phased to ensure the conservation of a minimum 2,000-foot-wide corridor for use by migrating mule deer. This would result in a reduced final footprint of the proposed Dawn WRDF which would reduce short-term surface disturbance of the Reconfiguration Alternative to 872 acres (approximately 10 percent less than the Proposed Action) and the amount of permanent surface disturbance in this portion of the project area to 144 acres (approximately 25 percent less than the Proposed Action) as a result of the open pits that would not be backfilled or reclaimed. Acreage of permanent disturbance includes

approximately 48 acres of Mixed Mountain and Low Sagebrush, 10 acres of Mixed Black, Wyoming and Mountain Sagebrush, 16 acres of annual grasslands, one acre of meadow habitat, and 69 acres of lands that have been previously disturbed. This alternative would result in less adverse impacts to special-status species that utilize habitat in this area.

Reclamation of mining disturbance and removal of mining support and ancillary facilities would occur as presented in Section 2.3.12, Closure and Reclamation Plan. Impacts of reclamation and removal of mining facilities would be similar to impacts resulting from mine construction and operation, including the presence of vehicles, equipment, and reclamation staff within the PoO boundary. During reclamation, increased dust, vibration, and noise would result in increased temporary disturbance in the areas where reclamation is actively being implemented. Periodic monitoring of reclamation success would result in the presence of reclamation staff, vehicles, and equipment within the PoO boundary.

Mammals

Bats

Potential impacts to bats species under the Reconfiguration Alternative would be the same as under the Proposed Action with the exception of a reduction of 151 acres of direct surface disturbance to suitable habitat.

Pygmy Rabbit

Potential impacts to this species under the Reconfiguration Alternative would be the same as under the Proposed Action with the exception of a reduction of 151 acres of direct surface disturbance to suitable habitat.

Although no evidence of pygmy rabbits was observed during field surveys, suitable habitat does exist within the study area. Proposed mitigation measure **SSS-1** presented in Section 3.18.4, Potential Monitoring and Mitigation Measures, would require HES to conduct clearance surveys of pygmy rabbit habitat prior to surface disturbing activities or removal of suitable habitat in order to ensure that potential impacts to the species are avoided and minimized to the extent practicable.

Birds

Potential impacts to avian species under the Reconfiguration Alternative would be the same as under the Proposed Action with the exception of a reduction of 151 acres of direct surface disturbance to suitable habitat. Potential impacts to this species as a result of the Reconfiguration Alternative are considered low due to the implementation of Applicant Committed Environmental Protection Measures, the overall availability of suitable habitat in the vicinity of the project, and the current level of activity at the mine site.

Additional species-specific impacts are discussed below.

Bald Eagle

Direct impacts to bald eagles under the Reconfiguration Alternative would include the long-term reduction of approximately 151 acres of foraging habitat for this species in comparison to the Proposed Action. Additional indirect impacts would be similar to those discussed in Section 3.18.2.1, Proposed Action.

Brewer's Sparrow

Direct impacts to Brewer's sparrow under the Reconfiguration Alternative would include the short-term reduction of 701 acres of sagebrush dominated habitat and the long-term reduction of approximately 57 acres of big sagebrush dominated habitat which comprises potential breeding and foraging habitat for this species until reclamation was completed and vegetation was re-established. Additional indirect impacts would be similar to those discussed in Section 3.18.2.1, Proposed Action.

Ferruginous Hawk

Direct impacts to ferruginous hawks under the Reconfiguration Alternative would include the long-term reduction of approximately 151 acres of foraging habitat for this species in comparison to the Proposed Action. Additional indirect impacts would be similar to those discussed in Section 3.18.2.1, Proposed Action.

Golden Eagle

Direct impacts to golden eagles under the Reconfiguration Alternative would include the long-term reduction of approximately 151 acres of foraging habitat for this species in comparison to the Proposed Action. Additional indirect impacts would be similar to those discussed in Section 3.18.2.1, Proposed Action.

Greater Sage-grouse

Potential impacts are anticipated to occur as a result of disturbance to sagebrush habitat within the study area under the Reconfiguration Alternative. Potential direct impacts would include the incremental reduction of approximately 57 acres of big sagebrush habitat in the long-term that may potentially provide nesting, early brood, late summer, and winter habitat.

Table 3.18-6 presents the acreage of surface disturbance that would occur under the Reconfiguration Alternative to GRSG habitat management categories PHMA and GHMA.

Under the Reconfiguration Alternative, 653 acres of PHMA and 219 acres of GHMA would be disturbed by the short term impacts of mine construction and operation using the 2014 habitat management categories. These acres of disturbance would be reclaimed at the completion of mining activity. In addition, 86 acres of PHMA and 58 acres of GHMA (2014 management categories) would be permanently removed under the Proposed Action as a result of the open pits that would not be backfilled or reclaimed.

Under the Reconfiguration Alternative, 662 acres of PHMA and 210 acres of GHMA would be disturbed by the short term impacts of mine construction and operation using the 2015 habitat management categories. These acres of disturbance would be reclaimed at the completion of mining activity. In addition, 91 acres of PHMA and 53 acres of GHMA (2015 management categories) would be permanently removed under the Proposed Action as a result of the open pits that would not be backfilled or reclaimed.

Table 3.18-6. Summary of Greater Sage-grouse Habitat Reconfiguration Alternative Impact Acreages

Habitat Category	Existing Acreage within Study Area[1]	Reconfiguration Alternative Temporary Impact[1] (acres)	Reconfiguration Alternative Permanent Impact[1] (acres)	Reconfiguration Alternative Impact Total[1] (acres)
2014 Habitat Management Categories				
PHMA	2,712	653	86	739
GHMA	1,019	219	58	277
OHMA	-	-	-	-
2014 Habitat Total	**3,731**	**872**	**144**	**1,016**
2015 Habitat Management Categories				
PHMA	2,657	662	91	753
GHMA	1,074	210	53	263
OHMA	-	-	-	-
2015 Habitat Total	**3,731**	**872**	**144**	**1,016**

[1] Numbers have been rounded to the nearest integer, totals may vary due to rounding.

Additional indirect impacts to GRSG would be similar to those discussed in Section 3.18.2.1, Proposed Action.

Potential impacts to this species under the Reconfiguration Alternative would be considered moderate due to the current level of activity at the mine site, and the absence of any active leks within the study area.

Loggerhead Shrike

Direct impacts to loggerhead shrike under the Reconfiguration Alternative would include the long-term reduction of approximately 151 acres of foraging habitat for this species in comparison to the Proposed Action. Additional indirect impacts would be similar to those discussed in Section 3.18.2.1, Proposed Action.

Sage Thrasher

Direct impacts to sage thrasher under the Reconfiguration Alternative would include the long-term reduction of approximately 151 acres of foraging habitat for this species in comparison to the Proposed Action. Additional indirect impacts would be similar to those discussed in Section 3.18.2.1, Proposed Action.

Swainson's Hawk

Direct impacts to Swainson's hawks under the Reconfiguration Alternative would include the long-term reduction of approximately 151 acres of foraging habitat for this species in comparison to the Proposed Action. Additional indirect impacts would be similar to those discussed in Section 3.18.2.1, Proposed Action.

Western Burrowing Owl

Direct impacts to western burrowing owls under the Reconfiguration Alternative would include the long-term reduction of approximately 151 acres of foraging habitat for this species in comparison to the Proposed Action. Additional indirect impacts would be similar to those discussed in Section 3.18.2.1, Proposed Action.

Human Presence and Noise

Impacts to special-status species would parallel those discussed in Section 3.17.2, Environmental Consequences.

Water Quantity and Quality

Impacts to special-status species would be the same as discussed in Section 3.18.2.1, Proposed Action.

Hazardous Materials Spill

Impacts to special-status species would parallel those discussed in Section 3.17.2, Environmental Consequences.

3.18.2.3 Livestock Fencing Alternative

The Livestock Fencing Alternative would be similar to the Proposed Action, except that a livestock exclusion fence would be installed around the perimeter of the PoO boundary as shown in **Figure 2-15** which would add 7 acres to the anticipated short-term surface disturbance in the project area. It is unlikely that the Fencing Alternative would impact special-status species because the fence is unlikely to exclude any of the special-status species discussed above in the Proposed Action. Under this alternative there is a potential for increased collision risk to avian species, including GRSG. As discussed in Section 2.4.3, Livestock Fencing Alternative, design specifications and installation of the fence would follow NDOW guidance and direction included in the BLM GRSG Amendment to reduce the potential for collisions by GRSG. The fence would be removed once the mine is reclaimed and revegetation is determined successful by the BLM and NDEP.

3.18.2.4 No Action Alternative

Under the No Action Alternative, the proposed project would not be developed, and impacts to special-status species would not occur. Under this alternative, 1,167 acres of wildlife habitat would not be disturbed or lost, as described under the Proposed Action. Additional habitat fragmentation and animal displacement would not occur, limiting the impacts to special-status species to existing conditions. Closure and reclamation of the existing and authorized mine disturbance and surface exploration activities within the project area would be conducted under the terms of current permits and approvals.

3.18.3 Cumulative Impacts

The CESA for special-status wildlife species is the same as that for general wildlife species and is defined in Section 3.18.1, Affected Environment, and is shown in **Figure 3.17-1**; the CESA for GRSG is presented in **Figure 3.18-1**. The past actions, present actions, and RFFAs are discussed in Section 3.2, Past, Present, and Reasonably Foreseeable Actions. RFFAs from mining and exploration activities are identified in **Table 3.2-1**; their locations are shown in **Figure 3.2-1** and **Figure 3.2-2**. **Figure 3.2-2** also illustrates some right-of-way actions.

3.18.3.1 Proposed Action

Potential cumulative impacts to special-status bat species, pygmy rabbit, Brewer's sparrow, golden eagle, and loggerhead shrike, would be similar to those described in Section 3.17.3, Cumulative Impacts. Cumulative impacts to these species would most likely occur where the project areas of RFFAs and the Proposed Action overlap the special-status species CESA. These impacts would occur over a larger

spatial area and a longer timeframe and would therefore be greater than the project-specific direct and indirect impacts.

Greater Sage-grouse

The types of cumulative impacts to GRSG resulting from the Proposed Action, when combined with ongoing projects and RFFAs, would be similar to those described under the Proposed Action in Section 3.18.2.1, Proposed Action, but to a greater degree and extent based on the increased development, disturbance, and project-related activity associated with ongoing projects and RFFAs.

The CESA for GRSG encompasses areas that are utilized by GRSG in relation to past, present, and RFFAs. **Table 3.18-7** presents the disturbance of GRSG habitat by wildfires (1980 to 2017) and mining operations. Past, present, and RFFAs from utility and energy development (North Elko Pipeline, Bell Creek Substation, Coyote Substation, and TS Power Plant) have resulted in approximately 420 acres of approved disturbance.

The GRSG CESA encompasses 700,701 acres of PHMA, 324,520 acres of GHMA, 342,675 acres of OHMA, and 118,546 acres of Non-Habitat. There are 17,115 acres of SFA within the GRSG CESA. The Proposed Action would contribute an estimated short-term disturbance of 679 acres in PHMA (0.1 percent of PHMA in the CESA) and an estimated long-term disturbance of 125 acres in PHMA (0.02 percent of PHMA in the CESA) as a result of the open pits that would not be backfilled or reclaimed. The cumulative area of disturbance to PHMA in the CESA would depend on the amount and location of disturbance approved during field-wide and site-specific approvals and development for the RFFAs. As shown in **Table 3.18-7**, approximately 59 percent of PHMA within the Tuscarora PMU has been previously disturbed by cumulative actions or impacts from wildfire. The acreages of disturbance from wildfire represent the majority of impacted acres (58%) of PHMA while disturbance from cumulative mining and other development actions represents approximately less than one percent of PHMA. Within GHMA, wildfire accounts for approximately 81 percent of disturbance acreages while cumulative mining or other actions have resulted in disturbance of approximately 5 percent of GHMA.

There are 94 leks that occur in the CESA; 84 inside of PHMA, 8 in GHMA, zero in OHMA, and 2 in non-habitat area. Of the 84 leks in PHMA, 28 of these are active leks, 39 are unoccupied, and 17 are pending. The cumulative density disturbance calculations for GRSG is calculated based on the BSU. BSUs are areas that represent local GRSG population use areas within the sub-region. Anthropogenic surface disturbance within each BSU is calculated once a year at the BLM National Operations Center (NOC), and is published on-line. The affected BSU for this project is the Owyhee BSU. The NOC calculated that in 2016, the percentage of PHMA within this BSU that is currently disturbed by development is approximately 0.54 percent.

Surface disturbance and human activities (e.g., noise) associated with RFFAs that overlap these leks have the potential to adversely affect these leks. Cumulative impacts could result in decreased lek attendance which would be affected by increased road development (Holloran 2005, Walker et al. 2007), intermittent cumulative noise increases, such as periodic heavy truck noise on roads (Blickley et al. 2002), and other project-related noise and activity during the construction and operation of the Proposed Action and the RFFAs. Male GRSG lek attendance was shown to decline within 1.9 miles of a haul road with traffic exceeding one vehicle per day (Holloran 2005), and female GRSG moved further away from breeding leks near development areas for nesting which resulted in lower nest initiation rates (Lyon and Anderson 2003).

Table 3.18-7. Cumulative Special-status Species Habitat Disturbance

CESA	Total Acres of Habitat	Acres or Habitat Disturbed by Fire	Acres Disturbed by the Proposed Action	Acres of Habitat Disturbed by Mining Operations (Past, Present, and RFFAs)	Acres of Habitat Disturbed by Utility and Energy Development (Past, Present, and RFFAs[1])	Total Acres of Habitat Disturbed by Cumulative Actions	Percent of Total Habitat Acres Disturbed
Special-status Species[2]	632,757	439,909	1,167	40,374	419	481,869	76
GRSG PHMA	700,701	413,315	804	1,205	92	415,416	59
GRSG GHMA	324,520	263,498	336	16,685	36	280,555	86
GRSG OHMA	324,675	262,932	0	5,226	17	268,175	83

Sources: Coates et al. 2014, BLM 2015g, BLM 2017b.

[1] See **Table 3.2-1** for a breakdown of mining projects.
[2] The special-status species CESA is identical to the wildlife CESA, excluding GRSG.

Habitat conditions within the GRSG CESA area most likely are not ideal because of fire history and the past, current, and future projected levels of human disturbance and noise levels from mining activities along the Carlin Trend. The potential loss of wetlands combined with mine groundwater pumping activities from other mining projects within the GRSG CESA could result in adverse impacts to important brooding habitat for GRSG and other special-status species (BLM 2010c). Loss of wetlands and reductions or eliminations of flows in springs and seeps could impact GRSG dependent on these sites and may impact the distribution and use of habitat during the spring, summer, and early fall. It is unlikely that the Proposed Action would contribute to the loss of wetlands as there are no naturally occurring wetlands within the study area. The Proposed Action may result in increased erosion and sedimentation of the Boulder Creek; however, as discussed in Section 3.14.1.2, Riparian Zones and Wetland Areas, the creek does not have any hydrologic connection with the Humboldt River and any upstream features that flow to Boulder Creek are isolated and lack a significant nexus with a traditional navigable water; therefore, impacts to water features in the study area as a result of the Proposed Action are unlikely to contribute to cumulative impacts throughout the GRSG CESA.

Climate Change

Potential changes to the project area resulting from the effects of climate change forecasted by the Central Basin and Range Rapid EcoRegional REA could include higher than normal growing season temperatures, contraction or expansion of some existing vegetation communities, the expansion of existing noxious weed populations, and the introduction of noxious weed species previously undocumented in the ecoregion and project area (Comer et al. 2013). Regarding temperature increases specifically, the Central Basin and Range REA forecasts an average increase in average summer maximum daytime temperatures of approximately 5°F within the project area by 2060 (Comer et al. 2013). These increases in average growing season temperatures are anticipated to result in low elevation basins throughout the Central Basin and Range ecoregion potentially transitioning from the existing cool semi-desert vegetation communities into very warm and sparsely-vegetated desert landscapes more typical of the Mojave Basin and Range. These potential shifts in vegetation communities could result in changes to wildlife species diversity and population densities. A number of studies have documented a decrease in biomass and productivity resulting from climate change in the Southwest. Anderson-Teixeira et al. (2011) found that the amount of above-ground plant biomass decreased as temperature increased and precipitation decreased in a central New Mexico study. With increasing atmospheric CO_2 levels, cheatgrass and other introduced annual grasses are expected to proliferate and continue to outcompete native species which can be expected to increase the frequency and size of wildfires in the area (Smith et al. 2000). An increase in wildfire frequency may result in the reduction of important seasonal habitats for GRSG and other special-status wildlife species within the project area and CESA. Ultimately, biodiversity in the CESA could be significantly reduced, which in turn might alter ecosystem processes such as primary production, nutrient dynamics and landscape water balance.

3.18.3.2 Reconfiguration Alternative

Cumulative effects under the Reconfiguration Alternative would be similar to impacts to special-status species discussed for the Proposed Action, except that 151 fewer acres of wildlife habitat would be disturbed in the long-term. Implementation of this alternative would result in less cumulative impacts to special-status species that utilize habitat near the proposed Dawn WRDF by reducing the final footprint of the proposed Dawn WRDF. Under the Reconfiguration Alternative, there would be long-term disturbance of 86 acres of GRSG PHMA, and 58 acres of GRSG GHMA; 31 percent and 16 percent respectively less than under the Proposed Action. As a result, long-term cumulative impacts to GRSG would be less pronounced under this alternative.

3.18.3.3 Livestock Fencing Alternative

Cumulative effects under the Livestock Fencing Alternative would be the same as those discussed under the Proposed Action, except that an additional 7 acres would be temporarily disturbed.

3.18.3.4 No Action Alternative

Cumulative impacts to special-status species for the No Action Alternative would be the same as those described for the Proposed Action except that there would be 1,167 fewer acres of habitat disturbance and reduced habitat fragmentation within the CESA.

3.18.4 Potential Monitoring and Mitigation Measures

Issue: Potential direct impacts to pygmy rabbits from mine construction.

Mitigation Measure SSS-1: Pre-construction clearance surveys for pygmy rabbits would occur prior to any surface disturbance. Pygmy rabbits are known to be active above ground throughout the year; therefore, clearance surveys would be required to be conducted regardless of the season. If occupied pygmy rabbit habitat is identified during pre-construction clearance surveys and occupied (especially natal) burrows are found, then new disturbance would not occur within 200 feet of those areas. If disturbance of these areas is determined to be unavoidable, consultation with the appropriate BLM and NDOW wildlife biologists would occur to develop avoidance strategies and mitigation techniques.

Effectiveness: By implementing mitigation measure **SSS-1**, potential direct impacts to pygmy rabbits and their habitat would be reduced.

Issue: Mortality resulting from GRSG striking fencing could impact GRSG populations within the project area.

Mitigation Measure SSS-2: For the proposed project alternatives, the installation of fencing located within greater sage-grouse PHMA, GHMA, and OHMA (based upon lek proximity and topography) should be minimized to the extent possible. In areas where the installation of fencing is unavoidable, in coordination with the BLM and NDOW, fencing would be modified or marked in a manner that results in increased visibility to greater sage-grouse. NDOW currently recommends using the NRCS Fence Collision Risk Tool to determine the need for fence marker placement.

Effectiveness: By implementing mitigation measure SSS-2, HES would be able to minimize mortalities of greater sage-grouse resulting from collisions with mine operations fencing.

Issue: The loss of GRSG PHMA and GHMA resulting from mine expansion.

Mitigation Measure SSS-3: Off-site compensatory mitigation for GRSG is a voluntary action under the 43 CFR 3809 Regulations and BLM IM 2018-093. HES is considering whether to voluntarily conduct the proposed potential mitigation measures for GRSG. Accordingly, the voluntary mitigation measures are presented in full in **Appendix A** of this EIS. These mitigation measures have been included in the analysis in the event that HES volunteers to participate in conducting off-site and/or compensatory mitigation for GRSG. HES is required to complete reclamation of the surface disturbance associated with the Rossi Mine for both mining operations and exploration activities, as outlined in this document at section 2.3.12. Even if HES does not volunteer to conduct any or parts of the potential mitigation measures described in **Appendix A**, reclamation would restore sage grouse habitat within the project area that is disturbed by the mining operation and exploration activities. Reclamation activities would be completed either concurrently when facilities are no longer needed or at the end of the mine life, except for approximately 194 acres of open pit for the Proposed Action or 144 acres of open pit for the Reconfiguration Alternative that would remain at the end of the mine life.

3.18.5 Residual Impacts

Assuming successful reclamation of all project components, residual impacts to special-status species habitat would include the permanent loss of approximately 194 acres and 144 acres for the Proposed Action and Reconfiguration Alternative, respectively. These residual impacts would be associated with open pits, which would not be revegetated. Residual impacts to GRSG habitat could be offset through HES's voluntary participation in funding and implementation of habitat enhancement projects adjacent to the Rossi Mine or through participation in the State of Nevada CCS as discussed in **Appendix A** of this EIS.

Depending on the success of final reclamation, fragmentation and the loss of shrub dominated communities would represent a long-term change in wildlife habitat composition (i.e., shrub-dominated communities to grass/forb-dominated communities). No residual impacts for special-status plant species are anticipated.

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3.19 Land Use and Access

The study area for land use encompasses the area within two miles of the proposed PoO boundary. The CESA for land use includes the Carlin Trend north of I-80. The study area for access includes the main roads within the proposed PoO boundary (the area within the proposed PoO boundary is defined as the project area), the Boulder Valley Road (the primary access road from the Dunphy Plant to the Rossi Mine), and I-80 between Battle Mountain and Elko. The CESA for access is the same as the study area (**Figure 3.19-1**).

3.19.1 Affected Environment

3.19.1.1 Land Use

The proposed project is located in Elko County, Nevada; the fourth largest county in the lower 48 states encompassing 10,995,840 acres (Elko County 2010). The majority of the land area in the county is managed by the BLM and other federal agencies, as shown in **Table 3.19-1**.

Table 3.19-1. Surface Ownership in Elko County, Nevada

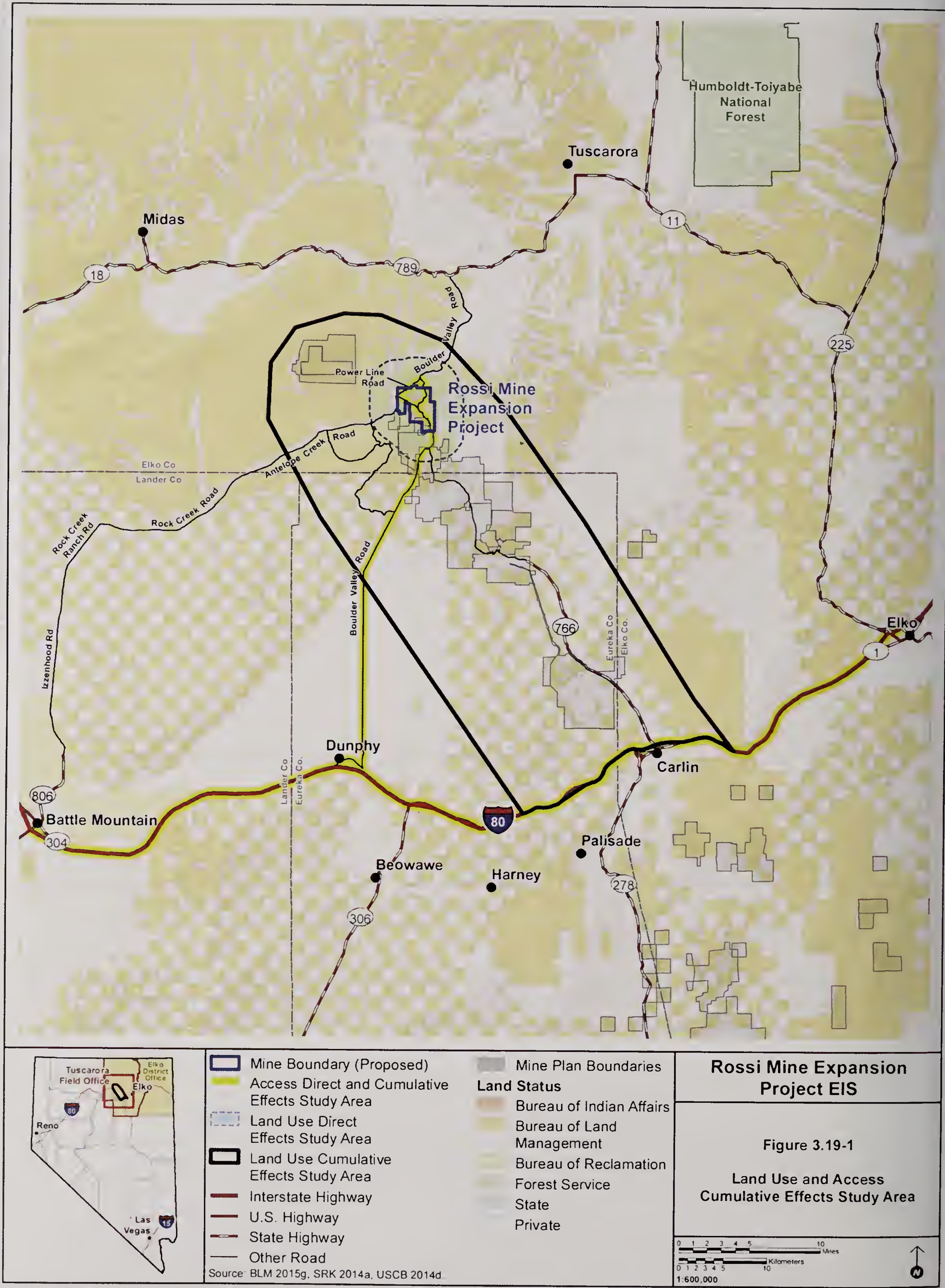
Agency	Acres	Percent of Total Surface Acres
Bureau of Land Management	6,882,161	62.6
U.S. Forest Service	1,073,143	9.8
U.S. Fish and Wildlife Service	26,872	0.2
U.S. Department of Defense	15,163	0.1
Tribal	160,823	1.5
State	15,241	0.1
Private /Local Government	2,822,437	25.7
Total	**10,995,840**	**100.0**

Source: Elko County 2010.

Public lands in the study area are managed under the 1987 BLM Elko Resource Area RMP. The RMP has designated the study area lands as open to locatable mineral entry (BLM 1986b, 1987a). Elko County manages lands according to the 2010 Elko County Public Land Use and Natural Resources Management Plan. The plan encourages continued mining under Policy 14-1, which states, “Retain existing mining areas and promote the expansion of mining operations and areas not specifically withdrawn” (Elko County 2010).

The study area includes approximately 25,521 acres, including 20,513 acres of BLM-administered land and 5,030 acres of private land controlled by BGMI and leased to HES. HES is currently authorized up to 912 acres for mining- and exploration- associated disturbance (SRK 2014g).

Land uses in the study area consist primarily of mining, mineral exploration, utility ROWs, livestock grazing, wildlife habitat, and dispersed recreation. The Proposed Action would allow exploration activities to occur anywhere within the project area. Barite has been mined from the Rossi Mine using open pit methods since 1947. The Rossi Mine is located on the northwest end of the Carlin Trend with large gold mines operated by BGMI and Newmont Mining Corporation to the south. The Arturo Mine, operated by BGMI, is adjacent to and overlaps the study area. The Hollister Underground Mine is located approximately 7.5 air miles northwest of the Rossi Mine and can be accessed by the Antelope Creek Road (SRK 2014g).



Rossi Mine Expansion Project EIS

Figure 3.19-1

Land Use and Access Cumulative Effects Study Area

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data. Original data were compiled from various sources. This information may not meet National Map Accuracy Standards. This product was developed through digital means and may be updated without notice.

2/20/2018

Livestock grazing is also a major land use in the vicinity. The Rossi Mine is located within the Twenty-Five Allotment, the only allotment in the area. The project area is currently not fenced, allowing the free movement of livestock and wildlife. There is no hay production or irrigated croplands within the study area. Hay is grown on irrigated private lands in Boulder Valley. Additionally, seasonal dispersed recreation activities in the area of the Rossi Mine include hunting, camping, limited off-road vehicle use, sightseeing, photography, hiking, rock climbing, and visiting old mining camps (BLM 2012a).

The nearest town is Battle Mountain, located about 50 road miles from the Rossi Mine. The nearest residence to the Rossi Mine is the St. John's Ranch, located about 5 air miles to the north. The St. John's Ranch is a seasonally used cowcamp owned by the 25 Ranch. The nearest year-round permanent residence is the TS Ranch headquarters located more than 20 air miles southwest of the Rossi Mine in Boulder Valley. The closest recreation area is the Willow Creek Reservoir, approximately 11 air miles to the north.

There are 25 land use authorizations and ROWs on BLM-administered land in the study area, as shown in **Table 3.19-2**.

Table 3.19-2. Land Use Authorizations and Rights-of-Way in the Study Area

Serial Number	Holder	Description/Use	Authorization Size[1] (Acres)
Authorized			
NVN-007639B	Sierra Pacific Power Company	Power transmission line	640
NVN-038874	Sierra Pacific Power Company	Power transmission line	9
NVN-047775	Sierra Pacific Power Company	Power transmission line	202
NVN-053160	Sierra Pacific Power Company	Power transmission line	128
NVN-055780	Barrick Gold of North America	Mineral Patent-Gold	316
NVN-058227	Newmont Gold Company	Mineral Patent-Gold	124
NVN-070250	Marigold Mining Company	Surface Management Plan-Gold	802
NVN-070547	Halliburton Energy Services	Surface Management Plan-Barite	912
NVN-070708	Barrick Goldstrike Mines	Surface Management Plan-Gold	9,062
NVN-070874	Barrick Gold Exploration	Surface Management Plan-Gold	51
NVN-071087	Newmont Mining Corporation	Surface Management Plan-Gold	1,271
NVN-071212	Trio Gold Corporation	Surface Management Plan-Gold	41
NVN-071213	Barrick Gold Exploration	Surface Management Plan-Gold	60
NVN-071216	Barrick Gold Exploration	Surface Management Plan-Gold	84
NVN-071234	Barrick Goldstrike Mines	Surface Management Plan-Gold	213
NVN-071238	Barrick Gold Exploration	Surface Management Plan-Gold	9
NVN-079647	Barrick Gold of North America	Geothermal Lease	1,703
NVN-087946	Barrick Goldstrike Mines	Surface Management Plan-Gold	2,774
NVN-089776	Sierra Pacific Power Company	Power transmission line	<1
NVN-090441	Sierra Pacific Power Company	Communication Site Coyote Creek Reflector	<1
NVN-090665	Energy Operations Management Inc., Prospector Pipeline Company	Natural gas pipeline connecting the Ruby Pipeline to the Barrick Goldstrike Mine	85
NVN-091284	Sierra Pacific Power Company	Power transmission line	14
NVN-091724	Sierra Pacific Power Company	Power transmission line	59

Table 3.19-2. Land Use Authorizations and Rights-of-Way in the Study Area

Serial Number	Holder	Description/Use	Authorization Size[1] (Acres)
Authorized			
NVN-092787	Barrick Goldstrike Mines	Road ROW	106
NVN-092976	Sierra Pacific Power Company	Power transmission line	22

Source: BLM 2015b.

[1] Acres have been rounded to the nearest integer.

3.19.1.2 Access

Access to the study area is from I-80 at the exit for Dunphy (exit 254) 32 miles north on the Boulder Valley Road. From the Rossi Mine, the Boulder Valley Road extends north and eventually connects to the Midas-Tuscarora Road (County Road 724), located north of the study area. Two additional roads cross the study area and connect to the Boulder Valley Road, the Antelope-Boulder Connector Road, which is a public road that connects the Boulder Valley Road to the Antelope Creek Road, and NV Energy's Powerline Road, which is a ROW 2-track road for the power line (**Figure 2-3** and **Figure 3.19-1**). All three roads are public access roads.

The Boulder Valley Road is an improved gravel road maintained by HES from the Dunphy Plant to the Rossi Mine under a road maintenance agreement with Elko County (HES 2014a). A short portion of the road immediately north of the PoO boundary near the Coyote Substation is also maintained by HES; however, north of this area the road is not maintained by HES. Authorized exploration roads and various secondary roads providing access to drill sites, ponds, and wells are located throughout the study area (SRK 2014a). HES maintains roads on a minimum basis within the PoO boundary. Ore concentrate is trucked from the mine to the Dunphy Plant via the Boulder Valley Road with up to 20 truck trips per day, 4 days per week, although the number of trips varies based on mining activity, jig plant processing rates, and the barite content of mined ore deposits (HES 2014a). The Boulder Valley Road is also used by other mining operators, utility companies, ranchers, and recreationists. North of the study area, this road is used to access the Willow Creek Reservoir by hunters and recreationists including anglers and campers (SRK 2014g).

The Antelope Creek Road is not maintained by HES and is used by mining operators to reach the Hollister Underground Mine (7.5 air miles to the northwest), the Tuscarora Midas road, and private property in the area (SRK 2014a). Powerline Road branches off the Antelope-Boulder Connector Road in the northwestern corner of the PoO boundary and connects to the Boulder Valley Road at the Coyote Substation, just north of the PoO boundary. Rossi Mine employees and contractor personnel commute from Battle Mountain, Carlin, Elko, and Spring Creek via I-80 to the Dunphy Plant and from there are shuttled to the mine in buses or vans. Several employees car pool to the plant and employees occasionally drive to the mine along with some vendors and contractors (SRK 2014a).

Traffic on I-80 includes local (residential, recreational, business, etc.) and regional traffic (for example, Battle Mountain or Elko to Carlin) and interstate through-traffic. Traffic in the study area is generated by mining activities, ranchers, hunters, and recreationists. As shown in **Table 3.19-3** the percentage difference between 2010 and 2014 traffic volumes on the three sections of 1-80 ranged from a 3 percent decrease to a 10 percent increase. The annual average volume on the 1.3-mile stretch of Boulder Valley Road in 2014 was 50 percent higher than the 2010 annual average volume. **Table 3.19-3** Annual Average Daily Traffic Volumes, 2010 and 2014 presents the annual average daily traffic recorded by NDOT in 2010 and 2014 on three sections of 1-80 and one section of Boulder Valley Road (a 1.3-mile stretch north of the frontage road) located within the CESA for access.

Table 3.19-3. Annual Average Daily Traffic Volumes, 2010 and 2014

Location	Annual Average Daily Traffic/Year		Change in Daily Traffic (%)
	2010	*2014*	
I-80, east of Battle Mountain	6,700	7,100	6
I-80, east of Dunphy	7,200	7,000	-3
Boulder Valley Road (1.3 miles north of frontage road)	60	90	50
I-80, east of Carlin	10,000	11,000	10

Source: DOT 2015a.

As shown in **Table 3.19-3**, traffic volumes increased from 6 to 50 percent at each location between 2010 and 2014, except for traffic on I-80 east of Dunphy which decreased by 3 percent.

In another study (SRK 2015c), traffic counts were also recorded on the Boulder Valley Road and the Antelope Creek Road over a period of 22 months, from October 2013 through June 2015. During that time the Antelope Creek Road experienced 2.6 times more traffic than the Boulder Valley Road, or 165 percent more traffic. The maximum vehicles per day on Antelope Creek Road occurred in June and July, with 33 and 27 vehicles recorded. On the Boulder Valley Road the maximum number of vehicles recorded were 14 and 10 vehicles per day in October and November, respectively. During the remaining months traffic counts were similar with an average count of six vehicles on the Antelope Creek Road and three vehicles on the Boulder Valley Road (SRK 2015c). The difference in traffic counts between the two roads is likely attributable to seasonal recreational traffic and mining operators on the Antelope Creek Road and also because mining employees are typically shuttled to and from Dunphy and the mine. The Antelope-Boulder Connector Road, the Antelope Creek Road, and the Boulder Valley Road are not maintained or kept open in the winter months. These roads are only open on a seasonal basis during the spring to fall when ground conditions are dry.

3.19.2 Environmental Consequences

Direct impacts could occur if there were a conflict with existing land uses or ROWs, or restrictions in public access, such as locked gates or blocked access as a result of the mine operations. Indirect impacts may result from a shift in land use patterns to other areas adjacent to or near the mine. Indirect impacts would also occur if the project resulted in development of land uses not presently anticipated or prohibited other planned or proposed uses.

3.19.2.1 Proposed Action

Land Use

Approximately 3,731 acres are within the proposed PoO boundary, including 3,520 acres (94 percent) of BLM-administered land and 211 acres (6 percent) of private lands. A total of approximately 2,063 acres of surface disturbance is planned under the Proposed Action or previously existing or authorized, of which 1,854 acres would be on public lands. This would add approximately 1,167 acres of new surface disturbance to the current authorization of 896 acres of surface disturbance, an increase of approximately 30 percent (**Table 2-10**). Disturbance on public lands would increase 52 percent, from 694 acres to 1,161 acres (**Table 2-10**). Proposed activities on private lands include expansion of the Queen Lode Pit and QLC pit (approximately 4 acres) and the growth media stockpile (approximately 2 acres) and support facilities (approximately 1 acre) (**Table 2-10**).

Under the Proposed Action, surface disturbance for exploration and mining activities would increase by approximately 1,167 acres within the proposed PoO boundary and the Twenty-Five Allotment, reducing the area available for dispersed recreation and livestock grazing. Compared to the total public lands available for these activities in the project vicinity, loss of this area would be considered minor.

Section 3.11, Recreation and Wilderness, and Section 3.16, Range Resources, address the effects on these activities in more detail. Once reclamation is completed and vegetation re-established, grazing could resume on approximately 973 acres.

Existing ROW authorizations within the proposed project boundary would not be affected or require relocation. New ROW authorizations would not be required for construction of a new communications tower and the power distribution line extensions as these facilities are located within the proposed PoO boundary. The communications site would be located near the Coyote Creek reflector site near the eastern expansion boundary (**Figure 2-4**).

The existing power distribution lines would be extended from the stepdown converter east of the jig plant to provide power to the jig plant area, potable water system, production wells, ready line, maintenance areas, and office buildings. Approximately 7,920 feet of new 24.9 kV distribution line is proposed including approximately 313 feet within the existing jig plant area (**Figure 2-4**). All new power distribution lines would be buried. Construction of the new communications site and the power distribution line extensions would not adversely affect land use or power availability in the area.

Under the Proposed Action, exploration would continue throughout the project area as described in Section 2.3.10, Exploration. Direct impacts to land uses and public access from exploration would include short-term loss of approximately 67 acres. Locations of future exploration activity depend upon the results of drilling activity; therefore, specific land use types that would be impacted cannot be identified. Exploration activities would not block access to public lands within the project area as temporary roads and drilling pads would not be permanently fenced. During exploration, HES may install temporary signage and fencing to notify the public of active drilling pads and equipment. Indirect impacts resulting from exploration activities would include increased fugitive dust, vibration, and localized soil compaction during road and pad construction and active drilling operations. Exploration would also result in an increase of fragmentation of the existing vegetation communities within the project area. This localized fragmentation may result in a small increase of OHV travel along temporary exploration roads within the project area.

Following reclamation of disturbed lands and reestablishment of vegetation, land uses would resume in the majority of the project area, consistent with BLM land use plans and guidelines. Approximately 194 acres of new open pit areas (public and private lands) would not be backfilled or reclaimed, remaining permanently unavailable for pre-mining land uses. Berms would be placed around the open pits along with signs for public safety.

Access

The existing infrastructure necessary to support mining operations already exists and construction of new facilities such as extended power lines, communications site, and ancillary support facilities would be gradually installed as needed over the 8-year expansion period. The majority of mining-related traffic would be associated with expansion of the open pits and WRDFs within the project area. The types of traffic generated by the proposed activities would be similar to the types of activities already occurring, but the volumes would fluctuate over the 8-year expansion period.

Workers would continue to commute via I-80 to the Dunphy Plant from Battle Mountain, Carlin, Elko, and Spring Creek. The number of workers commuting on I-80 could increase to a maximum of 360 at one time, including up to 60 HES employees and 300 mining contractor employees. The HES employees work 5 days per week, while mining contractor employees work three shifts per day. The resulting increase in traffic volumes along I-80 from commuters at the locations identified in **Table 3.19-3** would be minimal and vary throughout the day.

Traffic on the Boulder Valley Road would consist of vans and buses transporting workers to and from the mine to the Dunphy Plant. At maximum employment, HES employees would be transported in up to four vans per day over a 5-day work week. The mining contractor employees would require two buses per shift or six buses per day over the 5-day work week. Trucks haul ore from the mine to the plant over two 12-hour shifts per day for 4 days per week, with up to 20 truck trips per day. This equates to a maximum of 30 vehicle trips per day over 4 days (HES 2015f). During the day, the public traveling along the Boulder Valley Road could encounter up to 16 vehicles per day. Specific construction activities and material deliveries could periodically increase the number and type of vehicles traveling on the roads, but these

increases would be minimal and over short periods of time. HES would continue to maintain the Boulder Valley Road as needed to maintain the safety of workers and traveling public. Overall, effects of mine expansion on traffic, road conditions, and traveler safety are anticipated to be minor.

Sections of the Boulder Valley Road and the Antelope-Boulder Connector Road would be realigned to maintain public access through the mine area. Approximately 2,890 feet of the Boulder Valley Road would be realigned to the east to allow expansion of the proposed QLC Pit and approximately 2,879 feet of the Antelope Creek Road would be realigned to the west for expansion of the King Pit (**Figure 2-3**). The realigned sections would be constructed prior to expansion of the pit so public access would be maintained at all times through the area with one exception. Public access through the mine site would be temporarily restricted when HES conducts blasting in the pits. The Boulder Valley and Antelope-Boulder Connector Roads within the project area would be temporarily closed to the public during blasting of the pits, moving equipment throughout the mine site, and when conducting road maintenance. These road segments within the project area would be closed on average once a day for 15 minutes each day during pit blasting for public safety. These activities usually cause temporary delays that last a few minutes. Occasionally, delays may last for longer periods of time. The public road segments within the project area would be closed by locking gates or road barriers to prevent public access into the mine site during blasting activities. Although the temporary road closures would be an inconvenience to the public traveling through the mine site to other destinations, the short duration of the road closures would not prevent or unduly delay the public from traveling to their ultimate destination.

3.19.2.2 Reconfiguration Alternative

Impacts on land use and access under the Reconfiguration Alternative would be the same as those described for the Proposed Action, with the exception that the acres of surface disturbance on public lands would be 151 acres less, for a total of 1,016 acres. This equals an 8 percent reduction in disturbance compared to the Proposed Action. The final footprint of the Dawn WRDF would be reduced to maintain a minimum 2,000 foot wide undisturbed corridor for mule deer migration as shown in **Figure 2-8**. In addition, approximately 50 acres of the QLC Pit and 10 acres of the Dawn Pit would be backfilled. Reclamation of the backfilled areas would begin as soon as possible to reduce the duration of surface disturbance. The area of open pits on public lands would be correspondingly reduced by 50 acres, with a total of 144 acres of new open pit areas remaining that would not be reclaimed.

3.19.2.3 Livestock Fencing Alternative

Impacts on land use and access would be the same as those described for the Proposed Action, with the exception that a fence would be installed around the mine facilities to exclude livestock from the area as shown on **Figure 2-15**. The fence would encompass approximately 2,967 acres and slightly increase surface disturbance on public lands by approximately 7 acres more than the Proposed Action. Although the fence would reduce the area of public lands available for grazing within the Twenty-Five Allotment, this alternative would also reduce the risk of vehicular collisions with livestock and/or exposure to expanded mining activities. Loss of this area to livestock grazing would be minor given the size of the allotment (524,083 acres) and the potential benefit of increased safety for livestock. See Section 3.16, Range Resources, which addresses the effects on livestock grazing in detail.

After reclamation is completed, vegetation re-established, and the fence removed, grazing could resume on approximately 1,543 acres of proposed and existing/authorized disturbance that would be reclaimed. Acres permanently lost in the Twenty-Five Allotment from open pit expansion would be the same as the Proposed Action.

3.19.2.4 No Action Alternative

Under the No Action Alternative, the BLM would not approve expansion of the Rossi Mine and authorized mining and exploration operations would continue at current production rates. Portions of the King and Queen pits may continue to be partially backfilled under current authorizations. No surface disturbance would occur that has not been previously approved. Once mining operations have ended, reclamation would begin consistent with the existing approved reclamation plan, permits, and applicable federal and state closure and reclamation requirements.

Land Use

Current authorization for mining-related surface disturbance is 908 acres (**Table 2-3**), of which approximately 707 acres (78 percent) is on public lands and approximately 201 acres (22 percent) is on private lands. As of 2014, approximately 464 acres of surface disturbance existed within the mine boundary (SRK 2014a), approximately 52 percent of the approved surface disturbance. Exploration activities would continue as approved within the plan of operations boundary.

Mining and exploration operations would continue under the terms of current permits and approvals authorized by the BLM and the State of Nevada.

Land uses would continue to be mineral exploration and mining operations (including reclamation) livestock grazing, dispersed recreation and wildlife habitat. These activities would continue as they currently occur.

Access

Traffic generated by mine operations would continue to use the Boulder Valley Road and employees would continue commuting via I-80 to the Dunphy Plant before being shuttled or bussed to the mine site. HES maintains the Boulder Valley Road from Dunphy to the mine boundary on a year-round basis, as needed. The traffic associated with the mine is relatively light (up to 20 vehicles per day) and primarily related to ore hauling and vehicles transporting workers to and from the mine. Volumes fluctuate depending on the specific activities underway such as excavation or road maintenance. However, traffic is still well below the volume the road can accommodate. Commuter traffic on I-80 is already reflected in existing counts.

Access to public lands would remain unrestricted with signs posted throughout the mine site warning the public of potential hazards and active mining areas.

3.19.3 Cumulative Impacts

The CESA for land use includes the Carlin Trend north of I-80 as shown in **Figure 3.19-1**. The CESA for access is the same as the study area for access (**Figure 3.19-1**). Past, Present, and RFFAs are discussed in Section 3.2, Past, Present, and Reasonably Foreseeable Future Actions. RFFAs for mining and exploration activities are identified in **Table 3.2-1**; their locations are shown in **Figure 3.2-1** and **Figure 3.2-2**. **Figure 3.2-2** also illustrates some ROW actions.

3.19.3.1 Proposed Action

Land Use

A total of 37,182 acres of surface disturbance has occurred from past and present actions on the Carlin Trend north of I-80 related to mining, exploration, and pipeline and transmission line development. RFFAs would disturb an additional 4,467 acres, for a total of 41,649 acres from the same development activities. The Proposed Action would increase surface disturbance by 1,167 acres, for a total of approximately 42,816 acres. This equates to an incremental increase of 2.8 percent over past, present, and RFFAs.

Access

The amount of traffic generated by the past and present mining operations occurring in the Carlin Trend is unknown. The traffic created by the past and present mining operations in the Carlin Trend is already occurring on the Boulder Valley Road and I-80. Predicting the amount of traffic that would result from the RFFAs is also unknown, but would probably be proportional to the current mining operations. The effects of the amount of traffic on I-80 and the Boulder Valley Road due to the RFFAs would be dependent upon the time of implementation and its relationship to the current operations as well as the extent and type of RFFA activity. It is anticipated that the cumulative effects of the Rossi Mine Expansion Project traffic and safety would be minor.

3.19.3.2 No Action Alternative

Under the No Action Alternative, there would be no additional surface disturbance beyond the approved 912 acres. Traffic generated by past, present, and RFFAs is already occurring on I-80 and the Boulder Valley Road. Traffic would decrease when mining operations cease and cumulative effects under the No Action Alternative would be minimal.

3.19.3.3 Reconfiguration Alternative

Under the Reconfiguration Alternative, cumulative effects from surface disturbance would be similar to those described for the Proposed Action, except that 151 acres less would be disturbed than under the Proposed Action, for a total of 42,665 acres, an incremental increase of 2.8 percent. Effects on access would be the same as the Proposed Action.

3.19.3.4 Livestock Fencing Alternative

Under this alternative, cumulative effects from surface disturbance would be similar to those described for the Proposed Action, except that surface disturbance would increase by 7 acres for a total of approximately 42,823 acres (an incremental increase of 2.8 percent over past, present, and RFFAs). Effects on access would be the same as the Proposed Action. Upon successful reclamation and revegetation as determined by BLM and NDEP, the livestock fence would be removed.

3.19.4 Potential Monitoring and Mitigation Measures

No monitoring or mitigation measures are proposed for land use or access.

3.19.5 Residual Impacts

All surface disturbance would be reclaimed after the mine closes, with the exception of approximately 194 acres of proposed and existing/authorized open pits (public and private lands) that would not be backfilled or reclaimed; the land would be returned to pre-project land uses. Berms would be placed around the pit perimeters and signs posted warning the public of the open pits. After mine closure and completion of reclamation, there would be no project-related traffic or road maintenance and no residual access impacts from the proposed project.

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3.20 Noise

The proposed PoO boundary for noise effects encompasses an area within a 5-mile radius of the proposed PoO boundary. The CESA includes an area within approximately 10 miles of the study area as shown in **Figure 3.20-1**. The 5-mile direct noise effects study area is based on the estimation, derived from previous comparable projects, that mine noise would not exceed acceptable levels beyond that distance. The CESA is based on a doubling of the direct noise effects study area, assuming a comparable source, or sources, would have a similar direct effects radius.

This section discusses potential noise effects from the proposed project to humans. For a summary of project-related noise impacts to wildlife, refer to Section 3.17, Wildlife and Aquatic Biological Resources, and Section 3.18, Special Status Species.

3.20.1 Affected Environment

Describing the environment potentially affected by noise from the proposed project involves identifying noise-sensitive receptors and existing noise sources in the study area, characterizing terrain features that may affect noise transmission, and determining existing noise levels.

The proposed project is located in a remote area of western Elko County, just north of the Eureka County line, where the only signs of development are existing mines and a few remnants of historic mining projects. There are no occupied ranches within 5 miles of the proposed PoO boundary. The nearest residence to the Rossi Mine is the St. John's Ranch, located about 5 air miles to the north. The St. John's Ranch is a seasonally used cowcamp owned by the 25 Ranch. The nearest year-round permanent residence is the TS Ranch headquarters located more than 20 air miles southwest of the Rossi Mine in Boulder Valley. In effect, no human noise sensitive receptors have been identified within the area reasonably expected to be susceptible to project-related noise.

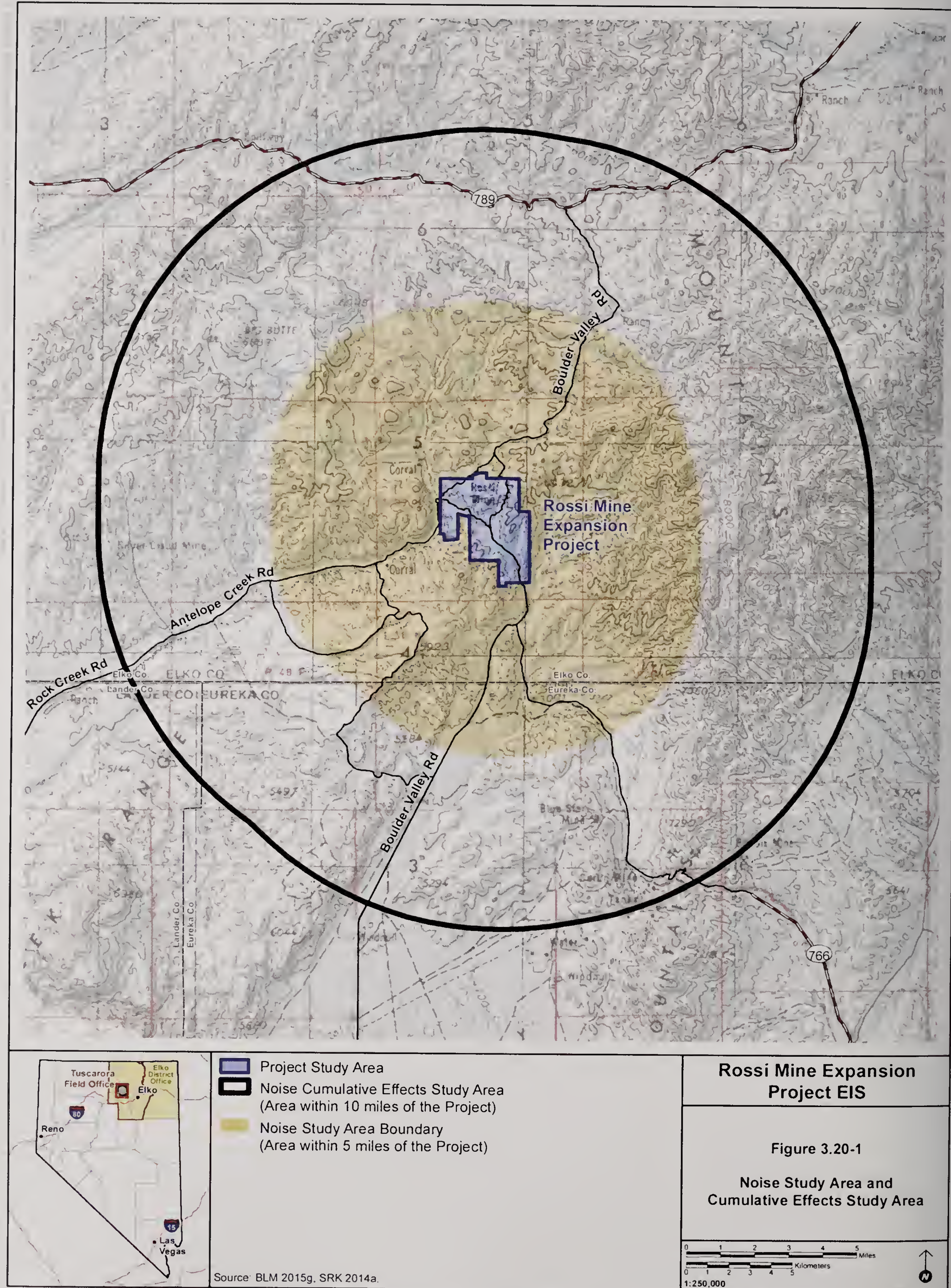
Man-made sources of noise in the study area include:

1. Arturo Mine located directly south of the proposed PoO boundary
2. Bootstrap Mine (inactive) located approximately 2 air miles south of the Rossi Mine
3. Goldstrike Mine located approximately five air miles southeast of the Rossi Mine.

Wind, insects, and birds are the principal natural contributors to ambient noise in the study area. Variations in wind speeds can have a dramatic effect on noise levels in the area. Mine traffic on the Boulder Valley Road, particularly from the Rossi Mine, generates periodic vehicular noise, although the traffic is generally light. There also may be a small amount of dispersed recreation-related traffic in the area on an occasional basis.

The study area is located along the western flank of the Tuscarora Mountains within the Boulder Flat and Rock Creek Valley Hydrographic Basins. The topography at the mine site area varies considerably with elevations ranging from approximately 5,200 feet amsl in the valley to 6,100 feet amsl along hilltops and ridgelines.

Because there are no occupied ranches or residences within 5 miles of the proposed PoO boundary no field noise measurements were taken for the purposes of characterizing existing noise levels near noise sensitive human uses. Refer to **Table 3.18-4** in Section 3.18, Special Status Species, for a summary of the noise data obtained at greater sage-grouse leks located within 3 miles of the northern PoO boundary.



Project Study Area

Noise Cumulative Effects Study Area
(Area within 10 miles of the Project)

Noise Study Area Boundary
(Area within 5 miles of the Project)

Source: BLM 2015g, SRK 2014a.

Rossi Mine Expansion Project EIS

Figure 3.20-1

Noise Study Area and Cumulative Effects Study Area

0 1 2 3 4 5 Miles

0 1 2 3 4 5 Kilometers

1:250,000

10/12/2017

No warranty is made by the Bureau of Land Management as to the accuracy, reliability, or completeness of these data for individual or aggregate use with other data.
Original data were compiled from various sources. This information may not meet National Map Accuracy Standards
This product was developed through digital means and may be updated without notice.

Table 3.20-1 provides brief definitions of terms and noise metrics used to describe measured sound levels.

Table 3.20-1. Definition of Sound Measurements

Sound Measurements	Definition
Decibel (dB)	A unit-less measure of sound on a logarithmic scale, which indicates the squared ratio of sound pressure amplitude to a reference sound pressure amplitude. The reference pressure is 20 micro-pascals.
A-Weighted Decibel (dBA)	An overall frequency-weighted sound level in decibels that approximates the frequency response of the human ear.
Equivalent Sound Level (L_{eq})	The equivalent steady state sound level that in a stated period of time would contain the same acoustical energy.
Percentile-Exceeded Sound Level (L_{xx})	The sound level exceeded "x" percent of a specific time period. L_{50} is the sound level exceeded 50% of the time and is called the median sound level. L_{90} is the sound level exceed 90% of the time and is called the residual or ambient sound level.
Day-Night Level (L_{dn})	The energy average of the A-weighted sound levels occurring during a 24-hour period, with 10 dB added to the A-weighted sound levels occurring during the period from 10:00 p.m. to 7:00 a.m.

As discussed in the noise effects analyses in Section 3.18, Special Status Species, ambient sound levels (L_{90}) are very low and averaged 18.6 dBA (**Table 3.18-4**).

Noise levels within 0.25 to 0.5 mile of existing mining activities likely are somewhat higher. In general, noise levels near active mining vary with the particular activity and with proximity of the activity to the observer. Measurements at other mine sites suggest noise levels commonly range between 45 dBA and 55 dBA at project boundaries (BLM 2012a). These levels typically result from equipment moving waste rock or ore and from drilling equipment. Blasting is likely to be noticeable at distances of 1 mile or more, but it is typically a minor consideration since it generally occurs once per day at the same time every day (at noon or time designated by mine such as during a shift change), because modern blasting techniques employ a series of small charges rather than a single large charge, and because the duration of a blast sequence is very short, on the order of less than 5 seconds. Because of these characteristics, blasting has very little effect on day-night average sound levels (Ldn).

For comparison purposes, **Table 3.20-2** illustrates noise levels associated with several common indoor and outdoor activities, which would help to understand noise emission levels from the proposed project.

Table 3.20-2. Typical Values of Sound Level of Common Noise Sources

Sound Pressure Level (dBA)	Common Indoor Noise Levels	Common Outdoor Noise Levels
110	Rock concert	
100		On platform by passing subway train
90		On sidewalk by passing heavy truck
80	Garbage disposal at 3 feet	On sidewalk by typical highway
70	Vacuum cleaner at 10 feet	On sidewalk by passing automobiles
60	Typical busy office	Typical urban area background
50	Dishwasher in adjacent room	Typical suburban area background
40	Theatre (background)	Quite suburban area at night
30	Voice – very soft whisper	Typical rural area at night
20	Isolated broadcast studio	
10		
0	Threshold of hearing	

Sources: Cowan 1994; Davis 1987; Caltrans 2013.

3.20.2 Environmental Consequences

Noise from project-related activities has the potential to affect noise sensitive human receptors. Noise impacts are commonly judged according to two general criteria: the extent to which a project would exceed federal, state, or local noise regulations, and the estimated degree of disturbance to people. Noise impacts to wildlife and special status species from the proposed project are discussed in sections 3.17 and 3.18, respectively. There are no specific federal, state, or local noise regulations that would govern at the proposed Rossi Mine project. Neither the State of Nevada nor Elko County has noise regulations governing mining and mineral exploration operations.

Without legislative guidance, the estimated degree of disturbance becomes the key factor in evaluating noise effects. The concept of human disturbance is known to vary with a number of interrelated factors, including not only changes in noise levels, but the presence of other, non-project related noise sources in the study area; peoples' attitudes toward the proposed project; the number of people exposed; and the type of human activity affected (e.g., sleep, quiet conversation or religious rituals as compared to physical work or active recreation).

In the absence of applicable noise regulations or specific standards, the noise analysis used 65 dBA L_{dn} as an absolute level criterion, and a 10 dBA increase above existing levels as a relative criterion, to evaluate projected project-related noise. L_{dn} is the average day sound level for a 24-hour, midnight to midnight period with 10 dBA added to the sound levels from 10:00 p.m. to 7:00 a.m. The 65 dBA L_{dn} criterion is based on the U.S. Department of Housing and Urban Development noise guidelines, which identify levels in excess of 65 dBA L_{dn} as "normally unacceptable" for exterior noise for residential areas (HUD 2009). A 10 dBA increase is perceived as a doubling of sound and is considered a likely indicator of community annoyance. The 10 dBA figure is based on USEPA studies showing that an increase of 10 dBA over existing background noise levels has commonly caused nearby residents to vigorously complain (USEPA 1974).

The study area has no residences or other gathering places, such as schools or churches that are commonly identified as noise sensitive areas. Because of this, it was necessary to conduct the noise analysis to identify anticipated distances to the threshold standards rather than potential noise levels at specific noise sensitive human receptors.

3.20.2.1 Proposed Action

The proposed Rossi Mine Expansion Project includes:

- Expansion of the PoO boundary;
- Expansion of the existing King Pit;
- Expansion of the existing Queen Lode and QLEE pits into the QLC Pit;
- Development of the Dawn Pit;
- Expansion of the existing King North WRDF;
- Construction of three new WRDFs (QLC North, QLC East, Dawn);
- Expansion or improvement of existing ponds for water storage and supply;
- Expansion and development of roads;
- Installation of buried power distribution lines within the PoO boundary only;
- Installation of a helicopter landing pad;
- Exploration throughout the project area; and
- Expansion or modification of ancillary support facilities.

The Proposed Action study area would encompass an area of 87,467 acres, or approximately 5.8 square miles. The main noise generating activity centers under the Proposed Action would include the expanded existing pits, the new Dawn Pit, the WRDFs, and the jig plant processing area. Ore crushing under the Proposed Action would continue as currently conducted under existing authorizations so the noise from the processing site is not expected to increase relative to existing operations.

Under the Proposed Action, exploration would continue throughout the project area as described in Section 2.3.10, Exploration. Direct impacts to visual resources from exploration would include short-term loss of approximately 67 acres. Locations of future exploration activity depend upon the results of drilling activity; therefore, specific locations that would be impacted cannot be identified. Indirect impacts resulting from exploration activities would include increased fugitive dust, noise, vibration, and localized soil compaction during road and pad construction and active drilling operations. Noise emissions from surface exploration activities would be generated by heavy equipment constructing drill sites, operating drill rigs, and drilling support equipment. Mine traffic traveling on on-site haul roads and the Boulder Valley Road would be an additional source of noise as well.

Barite mining commonly generates noise from two primary sources: operations of both stationary and mobile heavy equipment, and blasting to loosen waste rock and ore from the bedrock for removal by truck and shovel operations. Major sources of noise from mining and processing operations of the proposed project would include rock drilling, blasting, loading of rock and ore, ore and waste rock hauling, ore crushing, and crushed ore handling and distribution. Construction activity associated with development of new or expanded facilities and roads would be a source of noise as well. **Table 3.20-3** summarizes mobile equipment that is anticipated to operate under the Proposed Action.

Table 3.20-3. Rossi Mine Proposed Mobile Equipment and Associated Noise Emissions

Proposed Equipment[1]	Units	Sound Level at 50 feet (dBA)[2]
Front-end Loaders	13	90
Articulated Trucks	6	90
Haul Trucks	30	90
Over-the-Road Trucks	10	83
Track-mounted Drills	5	86
Bulldozers	12	85
Excavator/Track Hoes	4	85
Scrapers	3	84
Skid Steers	4	84
Graders	5	85
RC Drill Rigs	4	86
Core Drill Rigs	2	86
Backhoe	2	85
Water Trucks	8	83
Forklift	3	75
Service Vehicles	5	75
Mobile Generators	12	81
Truck Tractor and Lowboy	2	87
Light Vehicles	30	75
Cranes	2	85
Explosives Trucks	2	83
Portable light plants	12	78

[1] SRK 2014a
[2] Sound level reference data compiled from BLM 2012a and FHWA 2006

This equipment would be operated at various locations across the facility site. Because specific details on how and where equipment would operate across the project site are not available all equipment was conservatively assumed to operate concurrently with an acoustic center at the center of the project site.

Because there are no human noise sensitive receptors in the project area, no prediction of noise levels at specific human receptors was made. However, a general assessment was made of project-related noise relative to the 65 L_{dn} criteria described above. A number of factors determine how noise propagates over distance. The following are attenuation factors that were considered in this analysis (Hoover and Keith 2000):

1. Geometric attenuation – All sources were assumed to be point sources with an attenuation rate of 6 dB per doubling of distance
2. Atmospheric molecular absorption of 0.4 dB per 1000 feet
3. Shielding from topography based on site geometry and topography

To assess the potential distance to the 65 L_{dn} contour only geometric and atmospheric attenuation was considered because shielding from topography can vary substantially around the project site. This provides a very conservative estimate of project-related noise relative to 65 L_{dn}. Assuming concurrent

operation of all equipment listed in **Table 3.20-3**, the distance to the 65 L_{dn} contour is predicted to be about 9,200 feet or 1.74 miles. At a distance of 4.75 miles, project generated noise levels would drop below 10 dBA over background noise levels, conservatively assuming background noise levels at 40 dBA. There are no human noise sensitive uses within this distance.

Noise from project operation is predicted to be less than daytime L_{eq} noise levels. At night noise from project operation is either less than the existing L_{eq} noise level or no more than 10 dB above the existing L_{eq} noise level.

The Tosawihi Quarries are located approximately 9 air miles to the northwest from the proposed PoO boundary. Native American visitation or use of the Tosawihi Quarries would not be affected by noise generated from mining and mineral exploration activities based on the analysis presented above. Project related noise effects would be similar to existing authorized mining and exploration activities. Noise effects from the proposed project to recreational users and hunters and would be similar to noise impacts from existing authorized operations, and would not be affected based on the analyses presented above. Noise impacts from blasting are discussed below.

Blasting noise is not included in the noise level estimates noted above, mainly because mine blasting is typically an extremely brief event occurring an average of once per day at noon, depending on the operations plan for the pit. With this very brief and consistent type of noise emission, neither of the criteria noted for other mine-related noise is relevant to blasting noise. Although blasts are sometimes perceived by the layman to be a single explosion, mining blasts are actually a series of smaller, single-hole explosions. Each hole is sequentially delayed and detonated independently of the other holes. Less noise and ground vibrations are generated because several small blasts (delays) are detonated in sequence rather than as one large, instantaneous blast. Blasting can be further controlled by varying the amount of explosive, the type of delay, the delay sequence, the type of explosives, and the type of detonator used. Blasting for the proposed project would take place only during daylight hours typically at noon and would be conducted under strict MSHA safety procedures.

Table 3.20-4 shows typical peak air overpressure levels from blasting associated with a range of charge sizes and receiver distances (Caltrans 2013). Atmospheric and shielding effects are not included in this table.

Table 3.20-4. Typical Air Blast Levels from Blasting Operations

Distance (feet)	Charge Size (lbs)				
	10	20	40	80	160
	Air Blast Level (dB)				
100	128	131	133	135	138
250	119	121	124	126	128
500	111	114	116	119	121
1000	104	107	109	111	114
2000	97	99	102	104	107
4000	90	92	95	97	99
8000	83	85	87	90	92
16000	75	78	80	83	85
32000	68	71	73	75	78

Source: Caltrans 2013.

As discussed above there are no human noise sensitive uses in the project area so blasting would not affect human uses.

Blasting noise from the pits would likely be heard by Native Americans visiting the Tosawihi Quarries located approximately 9 air miles northwest from the proposed PoO boundary. Based on the data presented in **Table 3.20-4**, air blast noise levels could be in the range of 68 to 85 dB at the eastern portion of the Tosawihi Quarries. If topographic shielding (e.g., pit walls, landforms) and atmospheric attenuation are considered, these noise levels could be 15 to 20 dB less. An observer at the Tosawihi Quarries would likely hear blasting noise that could detract from the user experience; however, blasting noise would be lessened due to distance and topographic shielding, it would occur for a very short duration (less than 5 seconds), and occur once per day typically at noon that would alleviate much of the impact.

Blasting noise would have a negligible impact on recreationists and hunters due to the short duration of the blast, topographic shielding provided by pit walls, and frequency of blasting (once per day).

In summary, there are no human noise sensitive uses in the study area. Accordingly, the Proposed Action would not result in adverse effects to human uses. The analysis indicates that noise from project operation would not be more than 10 dB above existing L_{eq} sound levels.

3.20.2.2 Reconfiguration Alternative

Under the Reconfiguration Alternative, facility designs, operations schedules, anticipated workforce and employment, and Applicant Committed Environmental Protection Measures would be the same as the Proposed Action with the exception that sequencing of construction of the modified Dawn WRDF would be phased to ensure the conservation of a minimum 2,000 foot wide corridor for use by migrating mule deer, the final foot print of the proposed Dawn WRDF would be reduced to maintain a minimum 2,000 foot wide undisturbed corridor to allow for continued mule deer migration, the sequencing of the construction of the Dawn Pit would be modified, and construction of the QLC Pit and associated WRDFs would be modified (Sacrison Engineering 2015).

Noise emissions from this alternative are not expected to be measurably different from those anticipated from the Proposed Action. As a result, noise impacts associated with this alternative would be the same as the Proposed Action.

3.20.2.3 Livestock Fencing Alternative

Under the Livestock Fencing Alternative, a three or four strand, wildlife friendly livestock exclusion fence would be installed around the perimeter of the PoO boundary. All other aspects of the Proposed Action and Reconfiguration Alternative would remain the same if the Fencing Alternative is determined to be implemented with the project approval. Noise impacts associated with this alternative would be the same as the Proposed Action. The fence would be removed once the mine is reclaimed and revegetation is determined successful by the BLM and NDEP.

3.20.2.4 No Action Alternative

Under the No Action Alternative mining and processing operations at the existing Rossi Mine would continue under the terms of current permits and approvals as authorized by the BLM and the State of Nevada. The No Action Alternative would include completion of the closure and reclamation of the existing mine disturbance and reclamation of the surface exploration activities within the project area under the terms of current permits and approvals. Under the No Action Alternative, the proposed project would not be developed and subsequent noise impacts would not occur.

3.20.3 Cumulative Impacts

The CESA for noise is described in the introduction to Section 3.20 and is shown in **Figure 3.20-1**. The past, present, and RFFAs are discussed in Section 3.2, Past, Present, and Reasonably Foreseeable Future Actions. RFFAs for mining and exploration activities are identified in **Table 3.2-1**; their locations are shown in **Figure 3.2-1** and **Figure 3.2-2**. **Figure 3.2-2** also illustrates some ROW actions.

Past actions would have no effect on noise in the study area because noise emissions terminate at the completion of a project or activity. Any potential cumulative noise effects from present actions is included in the estimated background levels for the proposed project.

3.20.3.1 Proposed Action

Noise from RFFAs would not be expected to cause cumulative effects with noise from the proposed project because noise is localized to the area within 2 to 5 miles of an activity and there are no identified human noise sensitive receptors with the potential to be affected by project-generated noise.

3.20.3.2 Reconfiguration Alternative

Noise effects from the Reconfiguration Alternative would be the same as for the proposed project. No cumulative noise effects would be expected from this alternative.

3.20.3.3 Livestock Fencing Alternative

Noise effects under the Livestock Fencing Alternative would be the same as for the proposed project. No cumulative noise effects would be expected from this alternative. Upon successful reclamation and revegetation as determined by BLM and NDEP, the fence would be removed.

3.20.3.4 No Action Alternative

Under the No Action Alternative, noise levels from the proposed project area would decline after completion of subsequent reclamation activities and exploration activities. Noise from identified RFFAs also would decline over time as those projects are completed and reclaimed. Any cumulative noise effects in the study area would be minimal.

3.20.4 Potential Monitoring and Mitigation Measures

No impacts have been identified for human noise sensitive uses. Accordingly, no additional monitoring or mitigation measures are recommended for mine-related noise effects on humans.

3.20.5 Residual Impacts

Upon completion of the reclamation activities associated with previously approved projects and the proposed project, noise emissions would cease and there would be no residual noise impacts.

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3.21 Environmental Justice

The study area and CESA for environmental justice is the same as identified in Section 3.10, Social and Economic Values, and includes Elko, Eureka, and Lander counties, and the communities in these counties within commuting distance of the project and where the project related labor force may reside (**Figure 3.10-1**).These include the communities of Elko, Spring Creek, and Carlin in Elko County, Battle Mountain in Lander County, and Dunphy and Crescent Valley in Eureka County.

Executive Order 12898 requires federal agencies to identify and address the disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. CEQ prepared *Environmental Justice Guidance under the National Environmental Policy Act* (CEQ 1997b) to assist federal agencies in meeting their environmental justice commitments under NEPA. This section assesses whether there are minority or low-income populations in the study area, and whether there is disproportionately high and adverse human health or environmental effects.

3.21.1 Affected Environment

3.21.1.1 Minority Population

CEQ (1997b) provides the following definition of the term "minority": American Indian or Alaska Native, Asian or Pacific Islander, Black, and Hispanic. The guidance also instructs agencies to consider as a community either a group of individuals living in geographic proximity to one another, or a set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect. In addition, impacts should also be assessed on Indian tribes.

CEQ guidance instructs the identification of minority populations where either:

a) the minority population of the affected area exceeds 50 percent, or

b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.

Table 3.21-1 provides summary information on the presence of racial and ethnic minorities in the study area. In all counties and communities the percentage presence of racial and ethnic minorities is less than in the state of Nevada as a whole.

Table 3.21-1. Racial and Ethnic Minorities in the Study Area and Nevada, 2014

County and Community	Total Population	White and Not Hispanic or Latino Individuals	Racial and Ethnic Minority Individuals	Racial and Ethnic Minority Percent
Nevada	**2,761,584**	**1,455,192**	**1,306,392**	**47.31%**
Elko County	**50,991**	**34,654**	**16,337**	**32.04%**
Carlin	2,409	2,141	268	11.12%
Elko	19,308	12,163	7,145	37%
Spring Creek	14,012	12,318	1,694	12.09%
Lander County	**5,930**	**4,169**	**1,761**	**29.70%**
Battle Mountain	3,253	2,211	1,042	32.03%
Eureka County	**1,761**	**1,665**	**96**	**5.45%**
Dunphy	N/A[1]	N/A[1]	N/A[1]	N/A[1]
Crescent Valley	388	388	0	0%

Source: USCB 2014b.

[1] The resident population is below the threshold of a distinct community as defined by the U.S. Census Bureau (USCB 2014b) and is therefore not reported as a separate community.

The racial and ethnic composition within Elko, Eureka, and Lander Counties and the state of Nevada is presented in **Table 3.21-2**. Whites are the largest ethnic group in all three counties and the state. Hispanics make up the next largest ethnic group in each county and the state. American Indians represent 4.9 percent of the population in Elko County, in part attributable to the presence of the Elko Band Colony, one of four colonies that comprise the Te-Moak Tribe of the Western Shoshone. American Indian population in Elko County is more than five times greater than the state as a whole on a percentage basis and would be considered meaningfully greater than the minority population in the general population. Therefore, for purposes of identifying environmental justice concerns, a minority population, as defined by the guidance, exists in the study area.

There are three Indian Reservations in Elko County. The Duck Valley Indian Reservation, home of the Northern Paiute and Western Shoshone, straddles the Nevada/Idaho border, more than 100 road miles from the project area. The South Fork or Lee Indian Reservation is home to the South Fork Band of the Te-Moak Tribe of the Western Shoshone. The reservation is located southeast of the City of Elko at the western base of the Ruby Mountains, approximately 85 highway miles from the project. The Indian Reservation in the town of Elko is home to the Te-moak Tribe of the Western Shoshone and the Elko Band. In addition to these three reservations in Elko County, the Battle Mountain Reservation, home to the Battle Mountain Band of the Te-Moak Tribe of the Western Shoshone, is located on the west side of the town of Battle Mountain. This reservation is located approximately 59 miles from the Rossi Mine.

Table 3.21-2. Race and Ethnicity Percentages by County

	Elko County (%)	Eureka County (%)	Lander County (%)	State of Nevada (%)
White	68	94.5	70.3	52.7
Black	1.0	0.5	0.1	8.0
American Indian, Eskimo, Aleut	4.9	1.5	2.6	0.9
Asian or Pacific Islander	1.2	0.5	0.6	8.0
Other and Two or More Races	1.3	0	3.0	3.2
Hispanic Origin of Any Race	23.6	3.0	23.3	27.2

Source: USCB 2014b.

3.21.1.2 Low-Income Population

The CEQ environmental justice guidance instructs agencies to consider low-income populations to be those below the poverty thresholds from the USCB. Similar to the identification of minority populations, the guidance also instructs agencies to consider as a community either a group of individuals living in geographic proximity to one another, or a set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect (CEQ 1997b).

For the purposes of this analysis, similar criteria were used for the identification of low-income populations as was used for the identification of minority populations. Low-income populations were identified whenever either of the following criteria was met:

a) The low-income population of a community in the analysis area exceeds 50 percent.

b) The low-income population percentage of a community in the analysis area is meaningfully greater than that in the geographic area of comparison (the state of Nevada as a whole).

Table 3.21-3. Poverty and Median Household Income in Study Area and Nevada, 2014

County and Community	Persons with Income Below Poverty Level	Proportion of Population Below Poverty Level	Median Household Income
Nevada	**423,578**	**15.60%**	**$52,205**
Elko County	**4,966**	**9.90%**	**$72,280**
Carlin	142	6.40%	$74,044
Elko	1,489	7.90%	$74,433
Spring Creek	542	3.90%	$94,513
Lander County	**707**	**12.10%**	**$76,558**
Battle Mountain	303	9.50%	$84,861
Eureka County	**285**	**16.30%**	**$68,403**
Dunphy	N/A[1]	N/A[1]	N/A[1]
Crescent Valley	6	1.50%	$103,977

Source: USCB 2014c.

[1]The resident population is below the threshold of a distinct community as defined by the USCB (USCB 2014b) and is therefore not reported as a separate community.

Table 3.21-3 shows that poverty rates in all communities in the study area are lower than in the state of Nevada as a whole, with the exception of Eureka County. Because the difference in poverty rates for Eureka County and for Nevada is less than 1 percentage point, Eureka County's poverty rate is not considered to be meaningfully greater than that for the state of Nevada. Based on these data, none of the counties and communities within the study area would be considered to have low-income populations under EO 12898. In conclusion, the demographic and economic data reviewed indicate no minority or impoverished populations in the proximity of the Rossi Mine.

3.21.2 Environmental Consequences

3.21.2.1 Proposed Action

The existence of disproportionately high and adverse human health or environmental effects associated with the Proposed Action depends on the existence of minority and low income populations in the study area, and on the existence of adverse impacts that may disproportionately affect those populations. The analysis indicates that the potential effects of surface exploration activities and mine expansion under the proposed project would not be expected to disproportionally affect any particular population. The area in the immediate vicinity of the proposed project has no resident population. The nearest residence is more than five miles distant from the proposed project, and away from the primary transportation and expected worker commuting routes. The absence of a nearby resident population of any economic or demographic characteristic greatly reduces the potential for environmental justice concerns. The nearest residential areas are the communities of Dunphy and Carlin, located 32 and 35 air miles, respectively, away from the proposed project. In the larger surrounding communities, racial and ethnic minorities do account for relatively high shares of the overall population, particularly in Elko and Lander counties; however, in those communities the overall incidence of poverty has been and remains below the statewide average.

CEQ guidance also requires consideration of "impacts that may affect a cultural, historical, or protected resource of value to an Indian tribe or a minority population, even when the population is not concentrated in the vicinity." The analyses in Section 3.5, Cultural Resources, and Section 3.6, Native American Traditional Values, determined that of the fourteen areas identified through tribal consultation efforts as important to the Western Shoshone within proximity to the Rossi Mine, three areas are located within the proposed PoO boundary and one area is located adjacent to the proposed PoO boundary under the Rossi Mine expansion. The remaining 10 locations are located near or within 20 miles of the project area and several additional areas of importance are located 20 miles or more from the project area. These areas of importance to the Western Shoshone people consist of a combination of prayer places, ceremonial gathering places for plants and medicine, hunting areas for wildlife, ceremonial trails, potential burial sites and spiritual sites. Details regarding the potential for these areas to be impacted by the Proposed Action are presented in Section 3.6, Native American Traditional Values.

Executive Order 12898 and CEQ regulations (CEQ 1997b) require that subsistence consumption of wildlife be taken into consideration when addressing potential disproportionately high and adverse human health and environmental effects to minority populations, low-income populations and Indian tribes. In scoping comments to this EIS, the Te-Moak Tribe stated that the tribe relies on wildlife resources for cultural, religious and subsistence purposes. The Rossi Mine is located within Area 6 Management Unit where hunting is common, particularly that of mule deer. There are no data readily available on subsistence hunting of mule deer by the Te-Moak Tribe or other tribes or subsistence hunting of mule deer by other neighboring communities to compare reliance on mule deer hunting for subsistence among communities. This analysis considered whether the Rossi Mine expansion could affect the availability of mule deer for subsistence hunting by the tribes. Based on the analysis conducted in Section 3.17, Wildlife and Aquatic Biological Resources, and Section 3.11, Recreation and Wilderness, this analysis concluded subsistence hunting of mule deer would remain available to the Te-Moak Tribe and not be impacted in any meaningful way as the Area 6 Management Unit remains open and accessible to hunting.

A potential environmental justice concern is "whether communities have been sufficiently involved in the decision making process". The BLM held scoping meetings in Battle Mountain and Elko, distributed information to the public about the proposed project through mailings and notices in area newspapers, and published a formal notice regarding the proposed project in the Federal Register. The BLM has been

involved in an extensive consultation effort to involve the Native American tribes on the proposed project as described in Section 3.6, Native American Traditional Values. Details regarding specific Native American consultation and coordination efforts are presented in **Table 3.6-1**.

Although the potential for adverse impacts to biological and cultural resources identified as important to Native American tribes residing (historically and currently) within the general area of the Proposed Action does exist, based on this analysis, no disproportionate, adverse environmental justice effects would be anticipated from the development of the Proposed Action.

3.21.2.2 Reconfiguration Alternative

The Reconfiguration Alternative would have the similar or reduced environmental justice effects as described for the Proposed Action. Consequently, no disproportionately adverse environmental justice effects would be expected from the Reconfiguration Alternative.

3.21.2.3 Livestock Fencing Alternative

The installation of a livestock fence around mine facilities as described in Chapter 2.0 would not result in disproportionately adverse environmental justice effects under this alternative. The fence would be removed once the mine is reclaimed and revegetation is determined successful by the BLM and NDEP.

3.21.2.4 No Action Alternative

Under the No Action Alternative, the proposed project would not be developed, and associated environmental justice impacts would not occur. Any potential adverse effects on environmental justice were previously addressed in the permitting process for the existing facilities.

3.21.3 Cumulative Impacts

The CESA for environmental justice includes Elko, Eureka, and Lander counties. The past, present, and RFFAs for mining and exploration activities are identified in **Table 3.2-1** and their locations are shown on **Figure 3.2-1** and **Figure 3.2-2**. **Figure 3.2-2** also illustrates some ROW actions.

The environmental justice analysis did not identify any disproportionate effects from the Proposed Action Reconfiguration Alternative, or Livestock Fencing Alternative. Consequently, no cumulative environmental justice effects are anticipated as result of the Proposed Action or alternatives.

3.21.4 Potential Monitoring and Mitigation Measures

No monitoring or mitigation measures for environmental justice impacts are proposed.

3.21.5 Residual Impacts

There would be no disproportionate adverse environmental justice effects on minority or low-income populations; therefore, no residual environmental justice impacts are expected.

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3.22 Energy and Climate Change

3.22.1 Affected Environment

3.22.1.1 Energy

Electricity is supplied to the Rossi Mine by NV Energy's overhead transmission lines from the Coyote substation. Diesel fuel, gasoline, and kerosene are delivered by truck to storage tanks on site and used to fuel on-site vehicles and engine-powered equipment. The Rossi Mine does not use natural gas or other fuels.

3.22.1.2 Climate Change

The Department of Interior's Secretarial Order 3349, entitled "American Energy Independence and Economic Growth", was issued on March 28, 2017, and among other provisions, directs the CEQ to rescind their guidance requiring agencies to consider greenhouse gas emissions and effects of climate change in NEPA documents (CEQ 2016). GHG emissions and climate change analyses were already completed for the proposed project for this EIS by the time the Secretarial Order 3349 was issued; therefore, BLM decided to disclose the results of the analyses in the EIS.

Earth absorbs heat energy from the sun and returns most of this heat to space as terrestrial infrared radiation. GHGs consist of compounds in the earth's atmosphere that absorb long-wave infrared radiation (heat) emitted from the earth's surface and lower atmosphere (the portion of the atmosphere extending from Earth's surface to approximately 4 to 12 miles above the surface), and radiate much of it back to Earth's surface thereby causing warming. This process, known as the greenhouse effect, is responsible for maintaining surface temperatures that are warm enough to sustain life. Most GHGs, including carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), water vapor, and ozone, occur naturally. Human activities, particularly fossil-fuel combustion, as well as the use of several industrial gases that are GHGs, lead to increased concentrations of GHGs in the atmosphere, thereby intensifying the warming associated with Earth's greenhouse effect. Of the GHGs emitted due to human activity, the greatest contribution to warming comes from CO_2 emissions.

Since the industrial revolution, when fossil fuels began to be burned in large quantities, concentrations of GHGs in the atmosphere have increased. Although GHG levels have varied for millennia (along with corresponding variations in climatic conditions), industrialization and the burning of fossil carbon fuel sources have caused CO_2 concentrations to increase by more than 40 percent, from approximately 280 parts per million (ppm) in 1750 to over 400 ppm as of July 2015 (NOAA 2015b). The concentration of CH_4 is now 150 percent above pre-industrial levels (USEPA 2015e). The rate of change has also been increasing as more industrialization and population growth is occurring around the globe. Data from the Mauna Loa CO_2 monitor (NOAA 2015b) in Hawaii document atmospheric concentrations of CO_2 going back to 1960, at which time the average annual CO_2 concentration was recorded at approximately 317 ppm. This record shows that approximately 70 percent of the increases in atmospheric CO_2 concentration since pre-industrial times occurred within the last 54 years. The Intergovernmental Panel on Climate Change (IPCC 2013) has predicted that the average global temperature rise between 1990 and 2100 could be as great as 4.8 degrees Celsius [°C] (8.6 °F), which could have substantial adverse impacts on the natural environment. Many scientists believe this buildup of GHGs in the atmosphere is changing Earth's energy balance and causing the planet to warm, which in turn affects sea levels, precipitation patterns, cloud cover, ocean temperatures and currents, ocean acidification, polar snow and ice accumulation, and other climatic conditions. Scientists refer to this phenomenon as "global climate change."

Climate change is occurring in the U.S. including in Nevada. The National Climate Assessment report "Assessment of Climate Change in the Southwest United States" (Garfin et al. 2013) defined the Southwest as Arizona, California, Colorado, Nevada, New Mexico, and Utah. The report made the following observations, which are consistent with human-caused emissions of GHGs:

- The Southwest is warming. Average daily temperatures for the 2001-2010 decade were the highest since 1901.
- Recent drought has been unusually severe relative to droughts of the last century, but some droughts in the paleoclimate record were much more severe.
- Recent flows in the four major drainage basins of the Southwest have been lower than their twentieth century averages. Streamflow totals in the Sacramento-San Joaquin Rivers, Upper Colorado, Rio Grande, and Great Basin were 5 percent to 37 percent lower during 2001-2010 than their twentieth century average flows.

Climate scientists have high confidence that the climate of the Southwest would continue to change through the twenty-first century and beyond in response to human-generated greenhouse gas emissions (Garfin et al. 2013):

- Warming would continue, with longer and hotter heat waves in summer.
- Average precipitation would decrease in the southern Southwest and perhaps increase in northern Southwest (e.g., Nevada).
- Precipitation extremes in winter would become more frequent and more intense (i.e., more precipitation per hour).
- Late-season snowpack would continue to decrease.
- Declines in river flow and soil moisture would continue.
- Flooding would become more frequent and intense in some seasons and some parts of the Southwest, and less frequent and intense in other seasons and locations.
- Droughts in parts of the Southwest would become hotter, more severe, and more frequent.

These changes in the climate of the Southwest are expected to affect a number of resources (Garfin et al. 2013):

- Terrestrial and freshwater ecosystems
  - The distributions of plant and animal species would be affected by climate change.
  - Ecosystem function and the functional roles of resident species would be affected.
  - Changes in land cover would be substantial. Observed changes in climate are affecting vegetation and ecosystem disturbance. Among those disturbances are increases in wildfire and outbreak of forest pests and disease.
- Water
  - Climate change could further limit water availability in much of the Southwest.
  - Water availability could be decreased even more by unusually warm, decades-long periods of drought.
  - The past would no longer provide an adequate guide to project the future.
  - Surface water quality would be affected by climate change.
- Human health
  - Climate change would drive a wide range of changes in illness and mortality.
  - Allergies and asthma would increase in some areas.
  - Disadvantaged populations would probably suffer most.

- Agriculture, infrastructure, and communities
  - Agriculture would be affected by climate change.
  - Energy supplies would become less reliable as climate changes and climate change would drive increasing energy demand in some areas.
  - Climate change would affect urban areas in differing ways depending on their locations and on their response or adaptive capacities.
  - Reliability of transportation systems would decrease.
  - Native American lands, people, and culture are likely to be disproportionately affected by climate change.

The potential impacts of climate change on the affected resources in the project area and CESAs is further described in the cumulative impacts sub-section for the following resources:

- Section 3.4, Water Resources
- Section 3.14, Vegetation, including Riparian Zones and Wetland Areas
- Section 3.15, Noxious Weeds and Nonnative Invasive Species
- Section 3.16, Range Resources
- Section 3.17, Wildlife and Aquatic Biological Resources
- Section 3.18, Special Status Species

Annual emissions of GHGs in the United States were approximately 6,673 million metric tons (MMT) in 2013 (USEPA 2015f), estimated in carbon dioxide equivalents (CO_2(e)).[1] In Nevada, the total projected CO_2 emissions for 2015 were 42.2 MMT CO_2(e), of which an estimated 33.7 MMT CO_2(e) (80 percent) were from electrical power generation and transportation (NDEP 2012).

Regulatory agencies have not established specific thresholds for assessment of GHG emissions under NEPA. CEQ guidance on considering climate change under NEPA (CEQ 2014) suggests 25,000 MT per year as a reference level above which quantification of GHG emissions from a federal action should be considered.

At present, there is no regulatory program which requires reductions in GHG emissions from barite mines. The USEPA Mandatory Reporting of Greenhouse Gases Rule (40 CFR Part 98) requires monitoring, reporting, and recordkeeping of GHG emissions from suppliers of fossil fuels and facilities that emit greater than or equal to 25,000 metric tons (about 27,600 U.S. tons) of GHG per year and greater than 30 million British thermal units per hour.

3.22.2 Environmental Consequences

3.22.2.1 Proposed Action

The estimated annual direct GHG emissions from fuel consumption for the Rossi Mine Proposed Action are summarized in **Table 3.22-1**. **Table 3.22-2** adds the estimated annual indirect GHG emissions from electricity consumption from power generated by NV Energy to the direct GHG emissions to provide a summary of the estimated total annual GHG emissions from the Proposed Action.

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[1] CO_2(e) represents the quantity of CO_2 that would be required to produce the same global warming potential (GWP) as any given GHG. Typically, this value is presented over a 100-year period where a given quantity (i.e., 1 pound) of CO_2 is assigned a GWP of 1 and the same quantity of CH_4 has a GWP of 25. The GWP of N_2O is 298. Therefore, given the same mass quantities, CH_4 has an impact 25 times greater than CO_2, and N_2O has an impact 298 times greater than CO_2. (USEPA 2015e citing IPCC 2007b).

Table 3.22-1. Total Annual Direct GHG Emissions (tons) for the Proposed Action

Activity/Source	CO_2	CH_4	N_2O	CO_2(e)[1]
Equipment Exhaust	22,545	1.27	5.64E-01	22,745
Off-road Vehicle Exhaust	2,282	1.10E-01	5.05E-03	2,287
On-road Vehicle Exhaust	812	1.90E-02	2.92E-03	813
Well Drilling	21.6	2.10E-05	1.74E-04	21.6
Exploration Drilling	5,753	5.61E-03	4.63E-02	5,767
Operational Drilling (Blasting)	5,750	3.24E-01	1.44E-01	5,801
Other Generators	734	4.13E-02	1.84E-02	741
Pond Generator	197	1.11E-02	4.93E-03	199
Well Pump Generator	776	4.37E-02	1.94E-02	783
Other Generators	734	4.13E-02	1.84E-02	741
Total Direct GHG Emissions	**39,604.6**	**1.9**	**0.8**	**39,898.6**

Source: ICF 2016.

Table 3.22-2. Total Annual Direct and Indirect GHG Emissions (tons) for the Proposed Action

Power Consumption kilowatt-hours/year	Indirect GHG tons CO_2(e)/year	Direct GHG tons per CO_2(e)/year	Total GHG tons CO_2(e)/year
2,000,000	836.8	39,898.6	40,735.4

Source: ICF 2016.

HES implements several practices to reduce GHG emissions from the mine. HES provides company vehicles for select employees to carpool to and from the Dunphy offices during business days. HES also provides company vehicles to carpool and transport mine employees from the Dunphy offices to the Rossi Mine (includes jig plant and all Halliburton mine staff) and back. HES's mine contractor, N.A. Degerstrom, also provides buses and trucks to transport its employees from the Dunphy offices to the Rossi Mine in an effort to reduce the amount of vehicle emissions, including GHGs.

HES uses compact fluorescent light (CFL) bulbs in most mine buildings as an energy efficiency measure that reduces GHG emissions, and CFL bulbs are recycled by a contractor. The mine also employs waste minimization and recycling practices, thereby conserving raw materials. HES heats the mine maintenance building with a used oil heater that uses recycled oil from the mine operations. All batteries and aerosol cans used at the Rossi Mine are also recycled. HES plans to continue to implement these GHG emission reduction practices for the proposed project.

Under the Proposed Action, exploration would continue throughout the project area as described in Section 2.3.10, Exploration. Direct impacts to energy and climate change resources from exploration would include the emission of GHGs as presented in **Table 3.22-1** and the short term removal of approximately 67 acres of existing vegetation communities. Locations of future exploration activity depend upon the results of drilling activity; therefore, specific locations that would be impacted cannot be identified. Indirect impacts resulting from exploration activities would include increased fugitive dust, vibration, and localized soil compaction during road and pad construction and active drilling operations.

3.22.2.2 Reconfiguration Alternative

The Reconfiguration Alternative would have similar annual GHG emissions to the Proposed Action, but would be slightly less due to fewer haul truck trips needed per day and hence, less diesel fuel consumption.

3.22.2.3 Livestock Fencing Alternative

The Livestock Fencing Alternative would generate a negligible amount of GHG emissions relative to the Proposed Action and Reconfiguration Alternative.

3.22.2.4 No Action Alternative

Under the No Action Alternative, mining and processing operations would continue at the Rossi Mine under previous the terms of current permits and approvals as authorized by the BLM and State of Nevada. GHG emissions under the No Action Alternative would be reduced in comparison to the Proposed Action and other alternatives as the mine facilities would not be expanded and the existing mining operations would cease. Under the No Action Alternative, the GHG emissions anticipated to occur under the Proposed Action would not occur. This represents approximately 325,883 tons of direct and indirect GHG emissions that would not occur.

3.22.3 Cumulative Impacts

The Rossi Mine Expansion Project would emit CO_2(e) emissions that would incrementally add to the GHGs in the region from other sources as identified in Section 3.2, Past, Present, and Reasonably Foreseeable Future Actions. The proposed project represents <1 percent of the GHGs from all sources in the region, approximately 0.086 percent of the total projected emissions for Nevada in 2015.

3.22.4 Potential Monitoring and Mitigation

As noted above in Section 3.22.2.1, Proposed Action, HES currently implements several practices to conserve energy and reduce GHG emissions, and these practices would continue for the proposed project. No additional mitigation is proposed.

3.22.5 Residual Impacts

Residual impacts would include the emission of greenhouse gases after the application of HES Applicant Committed Environmental Protection Measures (**Table 2-16**).

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3.23 Relationship between Short-term Uses of the Human Environment and the Maintenance and Enhancement of Long-term Productivity

As described in Section 3.1, Introduction, short-term is defined as the 8-year mine life of the project and a 5-year reclamation period; long-term is defined as the future following reclamation (i.e., beyond 13 years). This section identifies the tradeoffs between the short-term impacts to environmental resources during operation and reclamation versus the long-term impacts to resource productivity that would extend beyond the end of reclamation.

The short-term use of resources during the expansion, operation, and reclamation of the proposed project would result in beneficial impacts in the form of an extension of local employment and the generation of revenue. The Applicant Committed Environmental Protection Measures that would be implemented for the proposed project would help to reduce impacts to the resources during operation of the mine.

The proposed project would result in various short-term impacts, including but not limited to:

- Temporary loss of soil;
- Loss of vegetation productivity;
- Loss of wildlife habitat;
- Potential wildlife avoidance and displacement of the project area;
- A reduction in dispersed recreation opportunities;
- Temporary increases in fugitive dust; and
- Increased noise levels.

These impacts are expected to end upon completion of operations and would be minimized through implementation of the reclamation plan as described in Section 2.3.12, Closure and Reclamation Plan.

The short-term visual impacts would last a few years beyond mine closure and gradually would be reduced as vegetation becomes more established at reclamation sites. The scale and extent of the facilities would continue to alter the local landscape and views in the long term.

Impacts to long-term productivity (i.e., following project reclamation) primarily would depend on the effectiveness of the proposed reclamation of the disturbance areas. Successful reclamation would provide for post-mining wildlife habitat and self-sustaining plant communities. Revegetation also is expected to stabilize disturbed surfaces and control erosion.

There would be a long-term loss in soil and vegetation productivity and associated terrestrial wildlife habitat, a reduction in livestock grazing areas, and public lands used for dispersed recreation resulting from mining facilities that would not be reclaimed (e.g., open pits).

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3.24 Irreversible and Irretrievable Commitment of Resources

The proposed project could result in the irreversible commitment of resources (e.g., the loss of future options for resource development or management, especially of nonrenewable resources such as minerals or cultural resources) or the irretrievable commitment of resources (e.g., the lost production or use of renewable natural resources during the life of the operations). Irreversible and irretrievable impacts of the proposed project are summarized for each resource in **Table 3.24-1**.

Table 3.24-1. Irreversible and Irretrievable Commitment of Resources under the Proposed Action

Resource	Irreversible Impacts	Irretrievable Impacts	Explanation
Geology and Minerals	Yes	Yes	Barite ore would be mined during operations. This would result in the irreversible and irretrievable commitment of this resource.
Water Quality and Quantity	Yes	Yes	If a pit lake develops in either the King or QLC pit, the evaporation for the pit lake would result in an irreversible and irretrievable impact to surface water within the pit lake.
Cultural Resources	Yes	Yes	National Register of Historic Places–eligible sites could be irreversibly and irretrievably lost if inventory, avoidance, and/or mitigation efforts are not sufficient to identify and protect these sites.
Native American Traditional Values	No	No	Adverse effects to religious, spiritual, or sacred values cannot be monitored or mitigated.
Hazardous Materials and Solid Waste	No	No	No irreversible or irretrievable commitment of resources or impact is anticipated. However, if a spill were to affect a sensitive resource, an irretrievable impact could occur pending the recovery of the resource.
Air Quality	No	No	Project emissions would not exceed federal or state Ambient Air Quality Standards. Air quality would return to existing conditions after completion of the project.
Paleontological Resources	Yes	Yes	There would be an irretrievable and irreversible loss of any paleontological resources in Carlin Formation areas buried by the WRDFs.
Social and Economic Values	Yes	Yes	Labor and some capital resources, once committed and expended, would not be retrievable.
Recreation and Wilderness	Yes	Yes	There would be an irretrievable loss of public land available for dispersed recreational opportunities during operations and reclamation. An irreversible loss would occur on approximately 194 acres (192 acres of public land and 2 acres of private land) associated with the expansion of the existing open pits (King and QLC), which would not be reclaimed. No irreversible or irretrievable commitment or impact of wilderness resources is anticipated.
Visual Resources	Yes	No	Impacts to visual resources would be reduced through successful reclamation procedures and implementation of the environmental protection measures. However, permanent changes would result from the expansion of existing open pits, which would not be reclaimed.
Soils	Yes	Yes	Suitable growth media would be salvaged from the mine disturbance areas for use in reclamation. There would be a loss of soil productivity during operations on approximately 1,167 previously undisturbed acres, for a total of 2,063 acres. There would be an irreversible commitment of the resource on approximately 194 acres associated with the expansion of the open pits (King and QLC), which would not be reclaimed.
Vegetation, including Riparian and Wetland areas	Yes	Yes	There would be an irretrievable commitment of vegetation resources on approximately 1,167 previously undisturbed acres during operations, for a total of 2,063 acres. There would be an irreversible commitment of the resource on approximately 194 acres associated with the expansion of the open pits (King and QLC), which would not be reclaimed. An irreversible and irretrievable impact to <1 acre of riparian zones and wetland resources (wetlands W-1 and W-7) is anticipated.

Table 3.24-1. Irreversible and Irretrievable Commitment of Resources under the Proposed Action

Resource	Irreversible Impacts	Irretrievable Impacts	Explanation
Noxious Weeds and Invasive Species	No	No	Disturbance areas within the proposed project area would be monitored to identify any noxious weeds and invasive species. If populations were observed within the proposed project area during operations, they would be treated and/or removed. Successful reclamation of disturbance areas also would minimize the potential for establishment of noxious weeds and invasive species within the proposed disturbance area.
Range Resources	Yes	Yes	There would be an irretrievable commitment of range resources on approximately 1,167 acres with a suspension of approximately 107 animal unit months (AUMs) during operations. In total, approximately 2,063 acres of surface disturbance would occur. An irretrievable loss of 18 AUMs would occur within the Twenty-Five Allotment from the expansion of the open pits (King and QLC), which would not be reclaimed.
Wildlife and Aquatic Biological Resources	Yes	Yes	There would be an irretrievable commitment of sagebrush shrubland, grassland, and riparian zone and wetland area wildlife habitat on approximately 1,167 acres during operations for a total of 2,063 acres. There would be an additional irreversible commitment of the resource on approximately 194 acres of mixed sagebrush shrubland, grassland, and riparian habitat associated with the expansion of the existing open pits (King and QLC), which would not be reclaimed.
Special Status Species	Yes	Yes	Same as described above for Wildlife and Aquatic Biological Resources.
Access and Land Use	Yes	No	There would be no irreversible or irretrievable impacts to access; public access patterns would be maintained. An irreversible loss would occur on approximately 194 acres of public land associated with the expansion of the existing open pits (King and QLC), which would not be reclaimed.
Noise	No	No	Noise is not considered irreversible because it would cease following the completion of mine operations.
Environmental Justice	No	No	The proposed project would not disproportionately affect minority or low-income populations.
Energy Requirements and Climate Change	No	Yes	There would be irretrievable energy consumption during the operations and reclamation. The proposed project would be expected to have a negligible effect on climate.

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4.0 Consultation and Coordination

This chapter provides a review of consultation and coordination with agency and public entities that has occurred prior to and during the development of this EIS.

4.1 Public Participation and Scoping

This section summarizes the consultation and coordination activities between the BLM and various federal agencies, state agencies, local agencies, non-governmental organizations, and individuals that occurred during the development of this EIS. Agency consultation and public participation have been accomplished through a variety of formal and informal methods, including scoping meetings, responses to e-mails, and meetings with individual public agencies and interest groups.

In order to identify agency requirements and public concerns related to the proposed project the BLM has conducted a public involvement process that is intended to 1) broaden the base of available information to support decision making, 2) inform the public about proposed actions and the potential impacts resulting from those actions, and 3) ensure that public concerns and needs are understood and addressed by agency decision makers.

The CEQ through NEPA requires the BLM to provide opportunities for the public to participate at four specific points in the EIS process: the initial project scoping period, the review and comment period of the Draft EIS, the review of the Final EIS, and the receipt of the ROD. These opportunities are defined as follows:

- Scoping: The public is provided a 30-day scoping period to disclose potential concerns and issues associated with the Proposed Action. Information obtained by the BLM and other agencies during the public scoping period is combined with issues identified by lead and cooperating agencies. The summarization of these issues form the scope of the alternatives and analysis in the EIS.
- Draft EIS Comment Period: A minimum 45-day Draft EIS comment period is initiated by the publication of an NOA for the Draft EIS in the FR. Members of the public are encouraged to provide comments on the Draft EIS via email or hardcopy to the address listed in the NOA. These public comments are combined with comments from the lead and cooperating agencies to form the basis for revising the Draft EIS into the Final EIS.
- Final EIS Review: A 30-day Final EIS availability period is initiated by the publication of the NOA for the Final EIS in the FR.
- ROD: Subsequent to the 30-day availability period for the Final EIS, the ROD would be prepared.

4.1.1 Scoping

The BLM initiated the public scoping process by publishing a Notice of Intent to prepare an EIS in the FR on September 9, 2015 (FR Volume 80, Number 174). Public scoping meetings were held on September 29, 2015, in Battle Mountain, Nevada; and September 30, 2015, in Elko, Nevada, to obtain input on issues and concerns to be evaluated in the EIS. The public scoping meetings were conducted in an open house format. Attendees were provided information about the project and given an opportunity to ask resource specialists and BLM representatives questions, as well as express their concerns.

The BLM received a total of 12 comment submittals (e.g., letter, comment form, or email) during the scoping period, resulting in a total of 131 comments and questions. Most of the comments the BLM received were from federal and state agencies. Scoping comments were used to help determine the scope of issues to be addressed and help identify the significant issues related to the Proposed Action. The Public Scoping Summary Report for this EIS (BLM 2015e) provides a detailed table listing each individual comment, its source, and where the comment would be addressed in the EIS. **Table 4-1** details the distribution of scoping comments by organization.

Table 4-1. Scoping Comments Distribution

Commenting Organization Name	Total Number of Comments
Public Citizens (3)	13
Nevada State Historic Preservation Office	3
Nevada Division of Environmental Protection, Bureau of Water Pollution Control	3
Nevada Division of Environmental Protection	3
Nevada Backcountry Hunters and Anglers	11
Coalition for Nevada Wildlife	7
Nevada Governor's Office of Economic Development	4
U.S. Environmental Protection Agency	54
Western Shoshone, Te-Moak Tribe, Battle Mountain Band Council	33
Total	**131**

Key issues identified during the scoping process included:

- Impacts to wildlife and wildlife habitat;
- Impacts to mule deer (*Odocoileus hemionus*) migration areas;
- Impacts to greater sage-grouse (*Centrocercus urophasianus*) and habitat;
- Impacts to surface and groundwater resources;
- Socioeconomic impacts;
- Impacts to cultural resources;
- Impacts to Native American traditional values;
- Cumulative impacts resulting from the approved action and other actions within the project vicinity.

4.1.2 Public Review of the Draft EIS

The Draft EIS is available for a 45-day public review and comment period from the date the NOA is published in the FR. Public meetings were held in Battle Mountain and Elko, Nevada during the 45-day comment period.

4.2 Consultation and Coordination with Federal, State, and Local Agencies, and Tribal Nations

Issues related to agency consultation and review included mining regulation and reclamation, biological resources, cultural resources, socioeconomics, air quality, and land and water management. Cultural resource consultations apply to the potential for impacts to important historic, archaeological, or traditional sites important to Native Americans. A Memorandum of Agreement between the BLM and Nevada SHPO would be utilized for the Section 106 process and this project.

The USEPA provided comments on a wide variety of topics including the development of alternatives, mitigation measures, surface water and groundwater quality and quantity, waste rock characterization and placement, closure and reclamation, air quality, waters of the United States, sensitive species, environmental justice, and socioeconomics.

The USFWS has participated as a cooperating agency during the development of the Draft EIS. The USFWS has provided input on the potential for federally listed, proposed, and candidate species to occur within the project area. The USFWS also reviewed baseline information regarding biological resources within the proposed project area including the applicant's Bird and Bat Conservation Strategy (BBCS). The USFWS also provided input on the potential for migratory birds, bald eagles, and golden eagles to occur within the project area in addition to the necessary steps the applicant should take to comply with the BGEPA and the MBTA.

As the state agency with jurisdiction and special expertise related to impacts on wildlife, NDOW participated as a cooperating agency in the preparation of this EIS. NDOW was primarily concerned with the placement of the Dawn Pit, QLC Pit, Dawn WRDF, and QLC WRDFs relative to big game movement corridors through the proposed project area in addition to potential impacts to greater sage-grouse. NDOW also provided information on mule deer migration corridors, as well as information on sage-grouse, mule deer, and pronghorn antelope (*Antilocapra americana*) use areas.

The Nevada Department of Conservation and Natural Resources, Sagebrush Ecosystem Technical Team (SETT), also participated as a cooperating agency for this EIS. SETT is part of the Nevada Sagebrush Ecosystem Program, a multi-disciplinary program established to protect and enhance the sagebrush landscape and habitat dependent species such as the greater sage-grouse.

In addition, the Elko County Commission also agreed to participate as a cooperating agency to review an analysis of the socioeconomic impact of mining on the county.

Executive Order 13084 directs the BLM to establish regular and meaningful consultation and collaboration with Native American Tribal governments on the development of regulatory policies and permit approvals for proposed projects that could significantly or uniquely affect tribal communities. On September 28, 2015 the BLM sent letters to the following tribes, bands, and interested parties notifying them of the project:

- Battle Mountain Band Council;
- Shoshone-Paiute Tribes of the Duck Valley Indian Reservation;
- Elko Band Council;
- Duckwater Shoshone Tribe;
- Ely Shoshone Tribe;
- Confederated Tribes of the Goshute Reservation;
- South Fork Band Council;
- Te-Moak Tribe of the Western Shoshone;
- Wells Band Council;
- Shoshone-Bannock Tribes of the Fort Hall Indian Reservation;
- Fort McDermitt Paiute-Shoshone Tribes of Nevada and Oregon;
- Timbisha Shoshone Tribe of Death Valley;
- Yomba Shoshone Tribe; and
- Other Interested Parties:
    - Bureau of Indian Affairs (BIA);
    - Western Shoshone Committee;
    - Western Shoshone Defense Project;
    - Western Shoshone Descendants of Big Smoky Valley.

The BLM presented project information and maps to the Chairpersons of the Te-Moak and Battle Mountain Band Tribal councils on November 24, 2015. The BLM also provided information regarding the proposed project to members of the Western Shoshone Committee on January 22, 2016, and the Elko Band Council on January 27, 2016. In addition, Native American field trips to the proposed project area occurred on December 28, 2015, and January 6, 2016. The field visits provided an opportunity for the

tribes and bands to view the proposed project area and identify any sites or places that may be of tribal importance. Any specific information provided by tribal members concerning Native American traditional use and/or spiritual sites in or near the proposed project area would remain confidential. Consultation with the contacted tribes and bands is ongoing and would continue as long as necessary. The tribes were provided a copy of the draft ethnographic report to comment on prior to submittal to the BLM. The draft report submitted to the BLM included any tribal comments. A summary of Native American consultation and coordination for the Rossi Mine Expansion Project EIS is provided in **Table 3.6-1** in Section 3.6, Native American Traditional Values.

4.3 List of Contacts

The following agencies, businesses, organizations, and individuals were contacted during the preparation of the Draft EIS.

4.3.1 Federal Agencies

- Bureau of Land Management – Nevada State Office, Reno
- Bureau of Land Management – Washington, D.C.
- Bureau of Reclamation – Carson City, NV
- Office of Public Affairs – Washington, D.C.
- U.S. Army Corps of Engineers – Reno, NV
- U.S. Army Corps of Engineers – Sacramento, CA
- U.S. Department of Agriculture Cooperative Extension Service – Fallon, NV
- U.S. Department of Agriculture, Forest Service Humboldt Toiyabe National Forest – Elko, NV
- U.S. Department of Agriculture, Forest Service Ruby Mountain/Jarbidge Ranger Stations – Wells, NV
- U.S. Department of the Interior, Bureau of Indian Affairs – Washington, D.C.
- U.S. Department of the Interior, Office of Environmental Policy and Compliance – Washington, D.C.
- U.S. Environmental Protection Agency – Las Vegas, NV
- U.S. Environmental Protection Agency – San Francisco, CA
- U.S. Environmental Protection Agency, Office of Federal Activities – San Francisco, CA
- U.S. Environmental Protection Agency, Office of Federal Activities – Washington, D.C.
- U.S. Fish and Wildlife Service – Reno, NV
- U.S. Post Office – Elko, NV
- U.S. Post Office – Tuscarora, NV

4.3.2 State Agencies

- Great Basin College, USDA Cooperative Extension Service
- Nevada Commission on Tourism, Motorsports Manager
- Nevada Department of Agriculture
- Nevada Department of Conservation and Natural Resources, Sagebrush Ecosystem Technical Team
- Nevada Department of Transportation – Carson City, NV
- Nevada Department of Transportation – Elko, NV
- Nevada Division of Environmental Protection/Bureau of Mining Regulation and Reclamation
- Nevada Division of Forestry

- Nevada Division of Minerals
- Nevada Division of Water Resources
- Nevada Department of Wildlife
- Nevada Mining Association
- Nevada State Clearing House
- Nevada State Historic Preservation Office
- University of Nevada, Cooperative Extension, Area of Natural Resources
- University of Nevada-Reno – Department of Mining Engineering
- University of Nevada-Reno – Department of Range, Wildlife, and Forestry

4.3.3 Elected Officials

- Theodore Beutel – Eureka County District Attorney
- John Ellison – State Assemblyman, Elko and Eureka Counties, NV
- Joe Heck – U.S. Representative
- Shelly Berkeley – U.S. Representative
- Dean Heller – U.S. Senator
- Harry Reid – U.S. Senator
- Catherine Cortez Masto – U.S. Senator
- City Mayor – Carlin, NV
- City Mayor – Elko, NV

4.3.4 Local Agencies

- City of Carlin
- City of Elko
- City of Wells
- Elko Chamber of Commerce
- Elko City Manager
- Elko City Planning Board
- Elko County Board of Commissioners
- Elko County Commission
- Elko County Commissioner
- Elko County Public Works Department
- Elko County School District
- Elko Public Land Use Planning Commission
- Eureka County Commissioners
- Eureka County Department of Natural Resources
- Eureka County Public Land Advisory Commission
- Humboldt County Board of Commissioners
- Humboldt River Basin Water Authority
- Lander County Clerk
- Lander County Planning Commission
- Mountain City, Nevada Post Office
- Owyhee Post Office

4.3.5 Tribal Organizations

- Battle Mountain Band Council
- Bureau of Indian Affairs – Eastern Nevada Agency
- Shoshone-Paiute Tribes of the Duck Valley Indian Reservation
- Duckwater Shoshone Tribe
- Elko Band Council
- Ely Shoshone Tribe
- Goshute Business Council
- South Fork Band Council
- Te-Moak Tribe of Western Shoshone
- Wells Band Council
- Western Shoshone Committee
- Western Shoshone Defense Council
- Western Shoshone Defense Project
- Western Shoshone Descendants of Big Smoky Valley
- Yomba Shoshone Tribe
- Timbisha Shoshone Tribe of Death Valley
- Shoshone-Bannock Tribes of the Fort Hall Indian Reservation
- Fort McDermitt Paiute-Shoshone Tribes of Nevada and Oregon

4.3.6 Media Outlets and Libraries

- Elko County Library
- Eureka County Library
- Great Basin College Library
- Lander County Library
- Nevada State Library
- Nevada State Library and Archives
- University of Nevada Libraries, Business and Government Information Center
- University of Nevada-Las Vegas, James Dickinson Library
- University of Nevada-Reno, Delamare Library

4.3.7 Private Organizations and Companies

In addition, a total of 34 private companies, 89 non-governmental organizations, and 36 private citizens were contacted during the preparation of the Draft EIS.

5.0 List of Preparers and Reviewers

5.1 Bureau of Land Management EIS Team

Resource/Responsibility	Name
BLM Project Lead, Geology and Minerals, Paleontology, Noise, Socio-economics, Environmental Justice	Janice Stadelman
Water, Soils, Air, Climate Change	John Daniel
Range, Vegetation	John Mitchell
Cultural Resources	Ryan Brown
Wildlife, Special-Status Species, Wetlands, Riparian	Nycole Burton
Lands and Realty	Elizabeth Puentes
Recreation	Mike Setlock
Visual, Wilderness, Wilderness Characteristics	Mike Setlock
Native American Traditional Values	Ryan Brown
Hazardous and Solid Wastes	Tom Schmidt
Noxious Weeds and Non-native Invasive Plant Species	Samantha Cisney
Air Quality Modeling	Tom Coulter
Cooperating Agency – Nevada Department of Wildlife	Lindsey Lesmeister
Cooperating Agency – Elko County Commissioner	Randy Brown, Eleanor O'Donnell
Cooperating Agency – U.S. Fish and Wildlife Service	Steve Abele, Chris Nicolai
Cooperating Agency – U.S. Environmental Protection Agency	Jamey Watt, Patrick Kelly

5.2 ICF EIS Team (Third Party NEPA Consultant)

Resource/Responsibility	Name
Project Director	Alan Rabinoff
Project Manager	Scott Duncan
Deputy Project Manager	Andrew Newman
Surface and Groundwater, Geology and Minerals, Geochemistry	Patrick Plumley (Plumley & Associates Inc.)
Soils and Reclamation	Gary Clendenin, Diana Roberts
Air Quality, Climate Change and Energy	David Ernst
Air Quality Modeling	Sharon Douglas
Range, Recreation, Wilderness, Paleontological	Dan Nally
Cultural, Native American Traditional Values	Karen Crawford
Ethnography	Terry McBride, Michelle Tiley, PhD (Community Pasts)
Wildlife, Special Status Species	Kristin Salamack
Vegetation, Wetlands, Riparian, Noxious Weeds and Non-native Invasive Plant Species	Lucas Bare
Land Use	Kim Stevens
Visual	Jennifer Stock, Tim Messick
Socioeconomics, Environmental Justice	Alex Uriarte, Will Cooper
Hazardous and Solid Wastes	Tanya Copeland
Noise	Dave Buehler
Lead Geospatial Analyst	Brent Read

5.3 Halliburton Energy Services Reviewers

Title	Name
Geologist/Environmental Specialist	Klete Fallowfield
Haynes Boone Legal Council	Michael Hegarty
Haynes Boone Legal Council	Chris Reagen
Haynes Boone Legal Council	Kathleen Repko
Haynes Boone Legal Council	Kimberly Wise

6.0 References

Abatzoglou, J.T. and C.A. Kolden. 2011. Climate change in western deserts: Potential for increased wildlife and invasive annual grasses. Rangeland Ecology and Management 64(5):471-478.

Adams, R.A. 2003. Bats of the Rocky Mountain West: natural history, ecology, and conservation. University Press of Colorado, Boulder, Colorado. xiii + 289 pp.

AECOM. 2012a. Spill Prevention, Control and Countermeasure Plan for N.A. Degerstrom, Inc., Rossi Mine Contracted Operations. August 12, 2012.

AECOM. 2012b. Appendix G – Air Quality Technical Support Document for the Hollister Underground Mine Project EIS. January 2012.

AECOM. 2012c. Stormwater Pollution Prevention Plan for Industrial Activities, Halliburton Energy Services, Inc., Rossi Mine, Battle Mountain, Nevada. March 2012.

AECOM. 2014. Wetlands and Waters of the U.S. Findings Report for Proposed Mine Facilities Expansion at Halliburton Energy Services Rossi Mine.

AECOM. 2015a. Quarterly Water Quality Monitoring Report, 2014 – Fourth Quarter, Halliburton Rossi Mine, Elko County, Nevada. February 2015.

AECOM. 2015b. Water Pollution Control Permit Application for a Physical Separation Facility – Supporting Documentation, Halliburton Energy Services, Inc., Rossi Mine, Battle Mountain, Nevada. August 2015.

AECOM. 2015c. Proposal for Monitoring Well Integrity Evaluation Proposal for Monitoring Well Integrity Evaluation and Rehabilitation, Halliburton Rossi Mine located near Dunphy, Elko County, Nevada. January 19, 2015.

AECOM. 2015d. Quarterly Water Quality Monitoring Report, 2015 – Second Quarter, Halliburton Rossi Mine, Elko County, Nevada. August 2015.

AECOM. 2015e. Quarterly Water Quality Monitoring Report, 2015 – First Quarter, Halliburton Rossi Mine, Elko County, Nevada. May 2015.

AECOM. 2016a. Water pollution Control Quarterly Compliance Monitoring Report – 2016 First Quarter, Halliburton Rossi Mine, Permit Number NEV2015112. April, 2016.

AECOM. 2016b. Water pollution Control Quarterly Compliance Monitoring Report – 2016 Third Quarter, Halliburton Rossi Mine, Permit Number NEV2015112. October, 2016.

AECOM. 2017a. Rossi Mine Expansion Operations Noise Analysis. Report prepared for Halliburton Energy Services, Inc. Report prepared by AECOM. June 19, 2017.

AECOM. 2017b. Water Pollution Control Permit, Quarterly Compliance Monitoring Report – 2017 First Quarter, Halliburton Rossi Mine, Elko County, Nevada. April 2017.

AECOM. 2017c. Water Pollution Control Permit, Quarterly Compliance Monitoring Report – 2017 Second Quarter, Halliburton Rossi Mine, Elko County. July 2017.

Agosta, S.J. 2002. Habitat use, diet and roost selection by the big brown bat (*Eptesicus fuscus*) in North America: a case for conserving an abundant species. Mammal Rev. 32(2):172-198.

Allan, R.P., and B.J. Soden. 2008. Atmospheric Warming and the Amplifications of Precipitation Extremes. Science 321:1481-1484. Available online: www.sciencemag.org. Accessed April 4, 2011.

Allen, E. 1991. Canvas Caravans: Based on the Journal of Esther Belle McMillian Hanna, who with her husband, Rev. Joseph A. Hanna, Brought the Presbyterian Colony to Oregon in 1852. UMI.

Ambrose, S., and C. Florian. 2014. Sound levels at greater sage-grouse leks, Pinedale Anticline Project Area, Wyoming, April 2013. Castle Valley, Utah.

Anderson-Teixeira, K.J., J.P. DeLong, A.M. Fox, D.A. Brese, and M.E. Litvak. 2011. Differential responses of production and respiration to temperature and moisture drive the carbon balance across a climatic gradient in New Mexico. Global Change Biology 17:410–424.

API (American Petroleum Institute). 2010. API Specifications for Drilling Fluids – specifications and Testing. API Specification 13A 18th Edition, August 2010. Available online: http://www.api.org/~/media/files/certification/monogram-apiqr/program-updates/13a-18th-edition-purch-guidlines-r1-2011-12-06.pdf.

Arnell, N., C. Liu, R. Compagnucci, L. da Cunha, K. Hanaki, C. Howe, G. Mailu, I. Shiklomanov, E. Stakhiv, and P. Döll. 2001. Hydrology and Water Resources. Pages 191-233 In: J.J. McCarthy, O.F. Canziani, N.A. Leary, D.J. Dokken, and K.S. White, Editors. Climate Change 2001: Impacts, Adaptation and Vulnerability. Cambridge, United Kingdom, Cambridge University Press.

Bales, R.C., N.P. Molotch, T.H. Painter, M.D. Dettinger, R. Rice, and J. Dozier. 2006. Mountain Hydrology of the Western United States. Water Resources Research 42, W08432.doi:10.1029/2005WR004387.

Barnett, T.P., D.W. Pierce, H.G. Hidalgo, C. Bonfils, B.D. Santer, T. Das, G. Bala, A.W. Wood, T. Nozawa, A.A. Mirin, D.R. Cayan, and M.D. Dettinger. 2008. Human-induced Changes in the Hydrology of the Western United States. Science 319:1080-1083. Available online: www.sciencemag.org. Accessed April 4, 2011.

Barnett, T.P., R. Malone, W. Pennell, D. Stammer, B. Semtner, and W. Washington. 2004. The Effects of Climate Change on Water Resources in the West: Introduction and Overview. Climate Change 62, 1–11. 2004.

Battelle. 2001. Comparative Risks of Hazardous and Non-hazardous Materials Truck Accidents/Incidents. Final Report. Prepared for the Federal Motor Carrier Safety Administration March 2001. Available online: http://www.fmcsa.dot.gov/safety-security/hazmat/reports/report-archives.htm.

BEA (Bureau of Economic Analysis). 2015. Per Capita Personal Income by County, 2012-2014. U.S. Bureau of Economic Analysis.

BEA. 2016. Quarterly Report of Personal Income by State; Third Quarter 2016. U.S. Department of Commerce. Available online: https://www.bea.gov/newsreleases/regional/spi/2016/pdf/spi1216.pdf.

Behnke, R.J. 1992. Native trout of western North America. American Fisheries Society, Monograph 6, Bethesda, Maryland.

Bengston, G. 2003 Northern Paiute and Western Shoshone Land Use in Northern Nevada: A Class I Ethnographic/Ethnohistoric Overview. Report on File, Bureau of Land Management, Elko, Nevada.

BGMI (Barrick Goldstrike Mines Inc.). 2015. Boulder Valley Monitoring Plan Second and Third Quarter 2015. Submitted to the Nevada Division of Water Resources, Office of the State Engineer, Carson City, Nevada. Barrick Goldstrike Mines Inc., Elko, Nevada. December 9, 2015.

Blickley, J., D. Blackwood, and G. Patricelli. 2012. Experimental Evidence for the Effects of Chronic Anthropogenic Noise on Abundance of Greater Sage-Grouse at Leks. Conservation Biology.

BLM (Bureau of Land Management). 1965a. Project Completion Report; Project # 1072, Boulder Fire Aerial Reseeding. October 25, 1965.

BLM 1986b. Final Elko Proposed Resource Management Plan and Final Environmental Impact Statement: Elko Resource Area, Elko District. Elko.

BLM 2015h. BLM National Invasive Species Information Management System (NISIMS) database. Provided by the BLM Elko District to ICF via digital transfer on June 23, 2015.

BLM and Nevada SHPO. 2014. State Protocol Agreement between The Bureau of Land Management, Nevada and the Nevada State Historic Preservation Officer for Implementing the National Historic Preservation act. Revised December 22, 2014. Available online: http://www.blm.gov/style/medialib/blm/nv/cultural.Par.65188.File.dat/State%20Protocol%20Agreement%20Dec%202014.pdf.

BLM. 1965b. Project Completion Report; Project # 1081, Boulder Fire Drill Reseeding. May 23, 1965.

BLM. 1979. Wilderness, Initial Inventory Decisions: Public Lands Administered by BLM Nevada. U.S. Department of the Interior, Bureau of Land Management.

BLM. 1981. Rossi Mine Expansion Environmental Assessment. EA-NV-010-81-028. U.S. Department of the Interior, Bureau of Land Management.

BLM. 1986a. U.S. Bureau of Land Management. 1986. Visual Resource Contrast Rating (BLM Manual Handbook 8431-1) Washington, DC: U.S. Government Printing Office.

BLM. 1987a. Elko Resource Area Resource Management Plan Record of Decision. U.S. Department of the Interior, Bureau of Land Management, Elko District Office, Nevada. March 11. Available online: https://eplanning.blm.gov/epl-front-office/projects/lup/78834/105629/129200/1987_Approved_Elko_RMP_and_Record_of_Decision.pdf.

BLM. 1987b. BLM Handbook 1740-1, Renewable Resource Improvement and Treatment Guidelines and Procedures. U.S. Department of the Interior, Bureau of Land Management.

BLM. 1991a. Draft Environmental Impact Statement (EIS) Betze Project. Barrick Goldstrike Mines, Inc. BLM, Elko District Office. January 1991.

BLM. 1991b. Final Environmental Impact Statement Betze Project, Barrick Goldstrike Mines, Inc. BLM Elko. Available online: https://ia800208.us.archive.org/24/items/finalenvironment00betz/finalenvironment00betz.pdf.

BLM. 1991c. Nevada BLM Statewide Wilderness Report. U.S. Department of the Interior, Bureau of Land Management. Available online: https://ia600307.us.archive.org/29/items/nevadablmstatewi5684unit/nevadablmstatewi5684unit.pdf.

BLM. 1993a. Rossi Mine South Waste Rock Dump Expansion Environmental Assessment. EA-NV-010-93-010. U.S. Department of the Interior, Bureau of Land Management.

BLM. 1993b. Draft Environmental Impact Statement, Newmont Gold Company's South Operations Area Project. May 1993.

BLM. 1994. Guidelines for Assessing and Documenting Cumulative Impacts. U.S. Department of the Interior, Bureau of Land Management. April. Available online: http://www.ntc.blm.gov/krc/uploads/194/5%20-%20BLM%20Cumulative%20impact%20Guide%201994.pdf.

BLM. 1998a. Rossi Mine Waste Rock Disposal Facility Expansion Project II Environmental Assessment. U.S. Department of the Interior, Bureau of Land Management.

BLM. 1998b. Manual 8270 – Paleontological Resource Management. Rel. 8-68. U.S. Department of the Interior, Bureau of Land Management.

BLM. 1998c. H-8270-1 – General Procedural Guidance for Paleontological Resource Management. Rel. 8-69. U.S. Department of the Interior, Bureau of Land Management.

BLM. 1998d. Programmatic Environmental Assessment of Integrated Weed Management on BLM Lands. US Department of the Interior, BLM, Elko District Office (BLM/EK/PL-98/008). March 1998.

BLM. 2000a. Finding of No Significant Impact and Preliminary Programmatic Environmental Assessment for: Selected Actions for Mining Claim and Millsite Use and Occupancy in Nevada. U.S. Department of the Interior, Bureau of Land Management, Nevada State Office. March.

BLM. 2000b. Cumulative Impact Analysis of Dewatering and Water Management Operations for the Betze Project, South Operations Area Project Amendment, and Leeville Project. U.S. Department of the Interior, Bureau of Land Management.

BLM. 2000c. Draft Supplemental Environmental Impact Statement, Betze Project, Barrick Goldstrike Mines, In. U.S. Department of the Interior, Bureau of Land Management, Elko Field Office, Elko, NV.

BLM. 2003. Migratory Bird Best Management Practices of the Sagebrush Biome. September 24, 2003.

BLM. 2004. Hollister Development Block Project Environmental Assessment. Elko Field Office. BLM/EK/PL-2004/002. Elko, Nevada. March 2004.

BLM. 2007a. South Operations Area Project Amendment Cumulative Effects, Draft Supplemental Environmental Impact Statement. BLM, Elko District Office, Nevada. August 2007.

BLM. 2007b. Leeville Project, Draft Supplemental Environmental Impact Statement. BLM, Elko District Office, Nevada. August 2007.

BLM. 2008a. Betze Pit Expansion Project, Draft Supplemental Environmental Impact Statement. BLM, Elko District Office, Elko, Nevada. August 22, 2008.

BLM. 2008b. National Environmental Policy Act Handbook, H-1790-1. Environmental Policy Handbook H-1790-1. Office of the Assistant Director, Renewable Resources and Planning (W200); 1849 C Street NW; Mail Stop 1050LS; Washington, D.C. 20240. January 2008. Available online: http://www.blm.gov/style/medialib/blm/ak/aktest/planning/planning_general.Par.2116.File.dat/Handbook.NEPA.H-1790-1.2k8.01.30[1].pdf.

BLM. 2008c. IM NV-2008-032 Nevada Bureau of Land Management's Water Resource Data and Analysis Policy for Mining Activities.

BLM. 2008d. Washington Office Instruction Memorandum No. 2009-018. Process for Setting Priorities for Issuing Grazing Permits and Leases. U.S. Department of the Interior, Bureau of Land Management. Washington, D.C.

BLM. 2009. Betze Pit Expansion Project, Final Supplemental Environmental Impact Statement Elko District Office, Elko, Nevada.

BLM. 2010a. Rossi Mine Expansion Environmental Assessment. DOI-BLM-NV-N020-2010-0008-EA. U.S. Department of the Interior, Bureau of Land Management. September. Available online: http://www.blm.gov/style/medialib/blm/nv/field_offices/elko_field_office/information/nepa/eas/rossi_mine_expanstion.Par.36967.File.dat/Rossi_EA.pdf.

BLM. 2010b. South Operations Area Project Amendment Cumulative Effects, Final Supplemental Environmental Impact Statement. BLM, Elko District Office, Elko, Nevada. April 2010.

BLM. 2010c. Leeville Project, Final Supplemental Environmental Impact Statement. BLM, Elko District Office, Elko, Nevada. March 2010.

BLM. 2010d. Maggie Creek Watershed Restoration Project and Upper Willow Creek Habitat Enhancement Plans.

BLM. 2011. Noxious Weed Treatment Extension Determination of NEPA Adequacy. BLM, Elko District Office, DOI-BLM-NVN-010-2011-0003-DNA. March 2011.

BLM. 2012a. Draft Environmental Impact Statement for the Arturo Mine Project. Bureau of Land Management, Elko District Office, Tuscarora Field Office, NV. December 2012.

BLM. 2012b. Draft Environmental Impact Statement for the Hollister Underground Mine Project. Elko District Office, Elko, Nevada. Available online: http://www.blm.gov/nv/st/en/fo/elko_field_office/blm_information/nepa/hollister_deis__6.html.

BLM. 2012c. Final Environmental Impact Statement (FEIS) for the Clark, Lincoln, and White Pine Counties Groundwater Development Project, BLM State Office, August 2012.

BLM. 2012d. Manual 6310, Conducting Wilderness Characteristics Inventory on BLM Lands. Rel. 6-129. U.S. Department of the Interior, Bureau of Land Management.

BLM. 2013a. Nevada and Northeast California Greater Sage-Grouse Draft Land Use Plan Amendment and Environmental Impact Statement.

BLM. 2013b. Final Environmental Impact Statement for the Hollister Underground Mine Project. U.S. Department of the Interior, Bureau of Land Management, Elko District Office, Tuscarora Field Office, NV.

BLM. 2014a. Final Environmental Impact Statement for the Arturo Mine Project. Bureau of Land Management, Elko Field Office. Elko, Nevada.

BLM. 2014b. Wilderness Study Areas. Available online: http://www.blm.gov/nv/st/en/prog/blm_special_areas/wsas0.html. Accessed February 22, 2015.

BLM. 2015a. Nevada and Northeastern California Greater Sage-Grouse Approved Resource Management Plan Amendment. Prepared by U.S. Department of the Interior, Bureau of Land Management, Nevada State Office. September 2015.

BLM. 2015b. Legacy Rehost System (LR2000). Case Recordation (MASS) Serial Register Page. Available online: http://www.blm.gov/lr2000/index.htm. Accessed December 17, 2015.

BLM. 2015c. Rangeland Administration System. U.S. Department of the Interior, Bureau of Land Management. Available online: http://www.blm.gov/ras/. Accessed July 31, 2015.

BLM. 2015d. Elko District BLM Office Sensitive Species List. Available online: https://eplanning.blm.gov/epl-front-office/projects/nepa/39007/52783/57479/Appendix_3D_-_Elko_District_Office_Special_Status_Species.pdf.

BLM. 2015e. Public Scoping Summary Report for the Rossi Mine Draft Environmental Impact Statement.

BLM. 2015f. Email correspondence from Janice Stadelman (BLM) to Scott Duncan (ICF) on September 20, 2015 regarding a response to an ICF data request.

BLM. 2015g. BLM Elko District Geospatial Information. Provided by the BLM Elko District to ICF via digital transfer on June 23, 2015.

BLM. 2016a. Email correspondence from Janice Stadelman (BLM) to Scott Duncan (ICF) on September 20, 2015 regarding a response to an ICF data request.

BLM. 2016b. Instruction Memorandum No. 2016-124. Subject: Potential Fossil Yield Classification (PFYC) System for Paleontological Resources on Public Lands. U.S. Department of the Interior, Bureau of Land Management. Washington, D.C. July 8, 2016.

BLM. 2016c. Personal communication; Information provided by J. Stadelman in email comments on the Draft EIS. Emailed to S. Duncan dated December 20, 2016.

BLM. 2017a. Alternative Reclamation Plant List. Email correspondence from Janice Stadelman (BLM) to Scott Duncan (ICF) on August 16, 2017.

BLM. 2017b. GIS shapefiles of wildfires within the Elko District. Email correspondence from Bradlee Mathews (BLM) to ICF on July 30, 2017.

BLS (Bureau of Labor Statistics). 2015a. Quarterly Census of Employment and Wages. NAICS based data files, county high-level. Available online: http://www.bls.gov/cew/datatoc.htm. Accessed: January 6, 2016.

BLS. 2015b. Labor Force Data by County, 2014 Annual Averages. U.S. Bureau of Labor Statistics.

Blum, M.E., K.M. Stewart, and C. Schroeder. 2015. Effects of large-scale gold mining on migratory behavior of a large herbivore. Ecosphere 6:74.

Bowling, D.R., S. Bethers-Marchetti, C.K. Lunch, E.E. Grote, and J. Belnap. 2010. Carbon, water, and energy fluxes in a semiarid cold desert grassland during and following multiyear drought. Journal of Geophysical Research 115: G04026, doi:10.1029/2010JG001322.

Bradley, P.V., M.J. O'Farrell, J.A. Williams, and J.E. Newmark Eds. 2006. The Revised Nevada Bat Conservation Plan. Nevada Bat Working Group. Reno, Nevada. 2016 pp.

Braun, C.E. 1998. Sage grouse declines in western North America: what are the problems? Proceedings of the Western Association of State Fish and Wildlife Agencies. 78:139-156.

Braun, C.E., O.O. Oedekoven, and C.L. Aldridge. 2002. Oil and gas development in western North America: effects on sagebrush steppe avifauna with particular emphasis on sage-grouse. Transactions of the North American Wildlife and Natural Resources Conference 67:337-349.

Brennan and Associates. 2015. Rossi Barite Mine Baseline Noise Levels, Elko County, Nevada. Prepared for Stantec, June 30, 2015.

Bryce, S.A., A.J. Woods, J.D. More, J.M. Omernik, T.R. McKay, G.K. Brackley, R.K. Hall, D.K. Higgins, D.C. McMorran, K.E. Vargas, E.B. Peterson, D.C. Zamudio, and J.A. Comstock. 2003. Ecoregions of Nevada (color poster with map, descriptive text, summary tables, and photographs). Reston, Virginia, U.S. Geological Survey (map scale 1:1,350,000).

Burton, R.F. 1862. City of the Saints. New York.

Call and Nicholas 2006. Gold Quarry Slide, Geotechnical Investigation, Failure Mechanisms Report. Prepared for Newmont Mining Corporation. Prepared by Ross C. Barkley, P.E., Paul R. Pryor, P.E., and David E. Nicholas, P.E. Call & Nicholas, Inc. January 2006.

Caltrans. 2013. Technical Noise Supplement to the Caltrans Traffic Noise Analysis Protocol. Sacramento, CA.

CEQ (Council on Environmental Quality). 1997a. Considering Cumulative Effects Under the National Environmental Policy Act. Council on Environmental Quality, Executive Office of the President. Available online: http://energy.gov/sites/prod/files/nepapub/nepa_documents/RedDont/G-CEQ-ConsidCumulEffects.pdf.

CEQ. 1997b. Environmental Justice, Guidance Under the National Environmental Policy Act. Council on Environmental Quality. December 10.

CEQ. 2010. Draft NEPA Guidance on Consideration of the Effects of Climate change and Greenhouse Gas Emissions. Available online: https://www.whitehouse.gov/sites/default/files/microsites/ceq/20100218-nepa-consideration-effects-ghg-draft-guidance.pdf.

CEQ. 2014. Revised Draft Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in NEPA Reviews. Available online: https://federalregister.gov/a/2014-30035. Accessed January 17, 2015.

CEQ. 2016. Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews. August 1, 2016.

Clemmer, R.O. 2009a. Pristine Aborigines or Victims of Progress? The Western Shoshones in the Anthropological Imagination. *Current Anthropology* 50 (6):849-881.

Clemmer, R.O. 2009b. Native Americans: The First Conservationists? *Journal of Anthropological Research*: 65:555-574.

Clemmer, R.O. 2009c. Band, Not-Band, or Ethnie: Who Were the White Knife People (Tosawihi)? Resolution of a "Mereological" Dilemma. Ethnohistory 56 (3):395-421.

Clemmer, R.O., and O.C. Stewart. 1986. Treaties, Reservations, and Claims. In Great Basin, edited by Warren L. d'Azevedo. pp. 525-557. Handbook of North American Indians, Vol. 11, W.C. Sturtevant, general editor. Smithsonian Institution, Washington D.C.

Clemmer. 1990. Tosawihi Quarry; A Report to the U.S, Bureau of Land Management, Elko District Office, Nevada. February 1990.

Coates, P.S., M.L. Casazza, B.E. Brussee, M.A. Ricca, K.B. Gustafson, C.T. Overton, E. Sanchez-Chopitea, T. Kroger, K. Mauch, L. Niell, K. Howe, S. Gardner, S. Espinosa, and D.J. Delehanty. 2014. Spatially explicit modeling of greater sage-grouse (*Centrocercus urophasianus*) habitat in Nevada and northeastern California—A decision-support tool for management: U.S. Geological Survey Open-File Report 2014-1163, 83 p., http://dx.doi.org/10.3133/ofr20141163.

Coates, P.S., M.L. Casazza, B.E. Brussee, M.A. Ricca, K.B. Gustafson, C.T. Overton, E. Sanchez-Chopitea, T. Kroger, K. Mauch, L. Niell, K. Howe, S. Gardner, S. Espinosa, and D.J. Delehanty. 2015. Updated Spatially explicit modeling of greater sage-grouse (*Centrocercus urophasianus*) habitat in Nevada and northeastern California—A decision-support tool for management (December 2015 Update): U.S. Geological Survey Open-File Report 2014-1163, 83 p., http://dx.doi.org/10.3133/ofr20141163.

Coates, R.R. 1986. Invertebrate and Paleobotanical Fossils Collected in Elko County, Nevada. Nevada Bureau of Mines and Geology Open File Report 86-1. Reno, NV.

Comer, P., P. Crist, M. Reid, J. Hak, H. Hamilton, D. Braun, G. Kittel, I. Varley, B. Unnasch, S. Auer, M. Creutzburg, D. Theobald, and L. Kutner. 2013. Central Basin and Range Rapid Ecoregional Assessment Report. Prepared for the U.S. Department of the Interior, Bureau of Land Management. 168 pp + Appendices.

Connelly, J.W., M.A. Schroeder, A.R. Sands, and C.E. Braun. 2000. Guidelines to Manage Sage Grouse Populations and Their Habitats. Wildlife Society Bulletin 28(4):967-985.

Connelly, J.W., S.T. Knick, M.A. Schroeder, and S.J. Stiver. 2004. Conservation assessment of greater sage-grouse and sagebrush habitats. Western Association of Fish and Wildlife Agencies. Unpublished Report. Cheyenne, Wyoming, USA.

Cowan, J.P. 1994. Handbook of Environmental Acoustics. Van Nostrand Reinhold, New York, NY.

Crawford, P.V. 1924. Journal of a Trip Across the Plains, 1851. Quarterly of the Oregon Historical Society 25 (June 1924):136-169.

Crum, S.J. 1994. Po'l Pentum Tammen Kimmappeh, The Road on which We Came: A History of the Western Shoshone. University of Utah Press, Salt Lake City.

D'Antonio, C.M., J.M. Levine, and M. Thomsen. 2001. Ecosystem Resistance to Invasion and the Role of Propagule Supply: A California Perspective. Journal of Mediterranean Ecology 2, 233-245.

Dantzker, M., G. Deane, J. Bradbury. 1999. Directional acoustic radiation in the strut display of male sage-grouse Centrocercus urophasianus. The Journal of Experimental Biology.

Davis, D. 1987. Sound System Engineering. Howard W. Sams & Co. Indianapolis, IN.

Deaver, S. 1993. Consultation with the Western Shoshone Regarding Newmont's South Operations Area Project. Ethnoscience, Prepared for the Bureau of Land Management, Elko Nevada.

Dettinger, M.D., D.R. Cayan, M.K. Meyer, and A.E. Jeton. 2004. Simulated Hydrologic Responses to Climate Variations and Change in the Merced, Carson, and American River Basins, Sierra Nevada, California, 1900-2099. Climatic Change 62:283–317.

DOT. 2015. Federal Motor Carrier Safety Administration. Nevada: Summary of Large Trucks Involved in Crashes 2005-2009. Available online: http://ai.fmcsa.dot.gov/CrashProfile/st_overview.asp?StCd=NV.

DOT. 2016. Scenic Byways – Elko County. Available online: https://www.nevadadot.com/Traveler_Info/Scenic_Byways/List.aspx. Last updated: 2015. Accessed: February 9, 2016.

Driver, H.E. 1937. Culture Element Distributions: VI. Southern Sierra Nevada. Berkeley: University of California Anthropological Records 1(2):53-154.

Ecosynthesis. 2013. Rossi Mine Expansion Survey of Riparian, Meadow, and Pond Features 2012. EcoSynthesis Scientific and Regulatory Services, Inc. Prepared for Halliburton Energy Services, Battle Mountain, Nevada. March, 2013.

Elko County. 2008. Public Lands Policy Plan. Available online: http://www.elkocountynv.net/departments/planning_and_zoning/docs/Public_Land_Use_Plan_Final.pdf.

Elko County. 2010. Elko County Public Land Use & Natural Resource Management Plan. Nevada.

Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual. Wetlands Research Programs Technical Report Y-87-1. U.S. Army Corps of Engineers. Available online: http://el.erdc.usace.army.mil/elpubs/pdf/wlman87.pdf.

Enviroscientists, Inc. 2011. Barrick Dee Mining Venture, Dee/Arturo Expansion Project, Elko, Nevada. Air Quality Impact Assessment Report. January 2011.

Erathem-Vanir. 2010. Paleontological Field Evaluation of the Proposed Hollister Mine Electric Line Corridor, June 22-23, 2010. BLM Report Number BLM 1-2815. August 31, 2010.

Ernstein, J. 2015. Letter of Concurrence from Nevada SHPO to BLM Elko District, dated July 20, 2015. On file, DOI Bureau of Land Management, Elko District, Elko, Nevada. Report No. BLM1-2956. Letter is on file at the Elko District BLM.

Ettner, D.C. 1989. Stratigraphy and Structure of the Devonian Autochthonous Rocks, North-Central Carlin Trend of the Southern Tuscarora Mountains, Northern Eureka County, Nevada. Thesis (M.S.), Idaho State University in cooperation with Boise State University.

Federal Land Managers Environmental Database. 2015. Database Query Wizard. Available online: http://views.cira.colostate.edu/fed/DataWizard/Default.aspx. Accessed December 2015.

FEMA (Federal Emergency Management Agency). 2016. Current and historic FEMA-issued flood maps for Elko and Eureka counties, Nevada. Available online: http://msc.fema.gov/portal. Accessed March 6, 2016.

FHWA (Federal Highway Administration). 2006. Roadway Construction Noise Model User's Guide. Final Report. FHWA-HEP-05-054 DOT-VNTSC-FHWA-05-01.

FLAG (Federal Land Managers' Air Quality Related Values Work Group). 2010. Phase I Report. Natural Resource Report. Available online: http://www.nature.nps.gov/air/Pubs/pdf/flag/FLAG_2010.pdf.

Floyd T., C.S. Elphick, G. Chisholm, K. Mack, R.G. Elston, E.M. Ammon, and J.D. Boone. 2007. Atlas of the Breeding Birds of Nevada. 581 pp.

FMCSA (Federal Motor Carrier Safety Administration). 2016. Large Truck and Bus Crash Facts 2014. FMCSA Analysis Division. March 2016. 120 pp. Available online: https://www.fmcsa.dot.gov/sites/fmcsa.dot.gov/files/docs/Large-Truck-and-Bus-Crash-Facts-2014%28April%202016%29.pdf.

Forney, J. 1858. Letter from the Superintendent of Indian Affairs, Salt Lake City, to the Commissioner. In: Letter received by the Office of Indian Affairs, 1824-1880, M-3234, Roll 899, February 15, 1959. National Archives Microfilm, Washington D.C.

Forney, J. 1859. Letter from the Superintendent of Indian Affairs, Salt Lake City, to the Commissioner. In: Letter received by the Office of Indian Affairs, 1824-1880, M-3234, Roll 899, February 15, 1959. National Archives Microfilm, Washington D.C.

Fox, D.G., A.M. Bartuska, J.G. Byrne, E. Cowling, R. Fisher, G.E. Likens, S.E. Lindberg, R.A. Linthurst, J. Messer, and P.S. Nichols. 1989. A Screening Procedure to Evaluate Pollution Effects on Class I Wilderness Areas. General Technical Report RM-168. U.S. Department of Agriculture, Forest Service Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. Available online: http://www.fs.fed.us/rm/pubs_rm/rm_gtr168.pdf.

Frid, A., and L. Dill. 2002. Human-caused disturbance stimuli as a form of predation risk. *Conservation Ecology* 6:11.

Garfin, G., A. Jardine, R. Merideth, M. Black, and S. LeRoy, eds. 2013. Assessment of Climate Change in the Southwest United States: A Report Prepared for the National Climate Assessment. A report by the Southwest Climate Alliance. Washington, DC: Island Press. Available online: http://swccar.org/sites/all/themes/files/SW-NCA-color-FINALweb.pdf. Accessed December 7, 2015.

Gelbard, J.L., and J. Belnap. 2003. Roads as Conduits for Exotic Plant Invasions in a Semiarid Landscape. Conservation Biology 17(2): 420-432.

Gill, J.A., and W.J. Sutherland. 2000. Predicting the consequences of human disturbance from behavioral decisions. Pages 51–64 in L.M. Gosling and W.J. Sutherland, editors. Behavior and conservation. Cambridge University Press, Cambridge, United Kingdom.

Gill, J.A., W.J. Sutherland, and A.R. Watkins. 1996. A method to quantify the effects of human disturbance for animal populations. Journal of Applied Ecology 33:786–792.

Giorgi, F., L.O. Mearns, C. Shields, and L. McDaniel. 1998. Regional Nested Model Simulations of Present Day and 2 X CO2 Climate over the Central Great Plains of the U.S. Climatic Change 40:457-93.

Golder (Golder Associates Inc.). 2014. Hydrogeologic Investigation – Phase I – Hydrogeologic Data Review and Field Investigation Work Plan – Rossi Mine, Elko County, Nevada. September 12, 2014.

Goodrich, G.B., and A.W. Ellis. 2008. Climatic Controls and Hydrologic Impacts of a Recent Extreme Seasonal Precipitation Reversal in Arizona. Journal of Applied Meteorology and Climatology 47(2):498-508.

Great Basin Bird Observatory (GBBO). 2010. Nevada Comprehensive Bird Conservation Plan, ver. 1.0. Great Basin Bird Observatory, Reno, NV. Available online: www.gbbo/bird_conservation_plan.html.

Great Basin Ecology. 2009. Barrick Dee Project Baseline Report. Prepared by Great Basin Ecology, Revised January 2009.

Handsaker, S. 1853. Journal of an overland Trip to Oregon via South Pass, Fort Bridger, Salt Lake City, Fort Boise, Grande Ronde, the Dalles, and the Columbia River (27 April-5 October 1853). Manuscript #FAC 590. Huntington Library, San Marino, California. Harmon, B.M. 2016. Cultural Resources Inventory of the Updated Plan of Operations Area at Rossi Mine in Elko County, Nevada.

Harmon, B.M. 2016. Cultural Resources Inventory of the Updated Plan of Operations Area at Rossi Mine in Elko County, Nevada. Draft Cultural Resources Report BLM 1-2942(P) prepared by P-III Associates; June 2012. Final Report Completed by B.M. Harmon of Kautz Environmental Associates, Reno Nevada. 76 pp.

Harmon, B.M. 2017. A Class III Cultural Resources Inventory for Expansion of the Rossi Mine Plan of Operations Boundary, Elko County, Nevada.

Harris, J. 1940. The White Knife Shoshone of Nevada. In: *Acculturation in Seven American Indians Tribes*, Ralph Linton, ed., pp.39-166. Appleton-Century, New York.

Hedquist, S., and L.A. Ellison. 2010. Condition and Damage Assessment of 96 Previously Recorded Archaeological Sites Located on the Tonto National Forest in Gila, Maricopa, Pinal, and Yavapai Counties, Arizona. Center for Desert Archaeology. November 2010.

Herrick, J.E., J.W. Van Zee, S.E. McCord, E.M. Courtwright, J.W. Karl, and L.M. Burkett. 2015. Monitoring Manual for Grassland, Shrubland, and Savanna Ecosystems. USDA-ARS Jornada Experimental Range P.O. Box 30003, MSC 3JER, NMSU Las Cruces, New Mexico 88003-8003. Available online: http://aim.landscapetoolbox.org/wp-content/uploads/2015/08/Monitoring-Manual-Volume-I_Core-Methods_ADVANCE.pdf.

HES (Halliburton Energy Services). 2014a. Rossi Mine Expansion Project. Baseline Socioeconomic and Environmental Justice Conditions. July. Prepared by Blankenship Consulting and Sammons/Dutton in association with SRK Consulting.

HES. 2014b. Rossi Mine Expansion. Rangeland Baseline Report. August. Prepared by Blankenship Consulting and Sammons/Dutton in association with SRK Consulting.

HES. 2015b. Jig Plant Processing Figure. Rossi Mine Expansion Kickoff Meeting Materials. Halliburton Energy Services. June 2015.

HES. 2015c. Email correspondence from Klete Fallowfield (HES) to Scott Duncan (ICF) and Janice Stadelman (BLM) on September 24, 2015 regarding a response to an ICF data request.

HES. 2015d. Correspondence from Klete Fallowfield, Halliburton to Scott Duncan, ICF regarding data request.

HES. 2015e. Information provided directly by Halliburton in response to request by BLM contractor.

HES. 2015f. Response to air quality data request from October 21, 2015.

HES. 2016a. Estimated Hazardous and Solid Waste Storage and Use Rates for the Rossi Mine Expansion and No Action Alternative. Provided via Email from Klete Fallowfield to ICF on February 24. 2016.

HES. 2016b. Revised Pit and WRDF Design Criteria. Provided via email from Klete Fallowfield to Scott Duncan on June 15, 2016.

HES. 2016c. Revised Pit and WRDF Volumes and Heights. Provided to ICF via email from Klete Fallowfield on January 26, 2016.

HES. 2016d. Clarification on Growth Media Deficit at Halliburton Rossi Mine, Memorandum. Submitted by K. Fallowfield May 27, 2016.

HES. 2016e. Memorandum from Klete Fallowfield, Tim Koski (HES) to Scott Duncan, Andrew Newman (ICF International) and Janice Stadelman (BLM), Halliburton Preliminary Design for Seeps Drainage System – Rossi Mine Expansion. May 13, 2016.

HES. 2016f. Memorandum from Klete Fallowfield, Tim Koski (HES) to Scott Duncan (ICF) and Patrick Plumley (Plumley & Associates, Inc.): Clarification on Not Mining Unoxidized Materials in Rossi Queen Lode Complex. May 9, 2016.

HES. 2016g. Communications with Klete Fallowfield of Halliburton Energy Services. April 10, 2016.

HES. 2016h. 2016 Rossi Mine Surveying Memorandum. Submitted to BLM and NDOW by Klete Fallowfield on May 20, 2016.

HES. 2016i. Noxious and Invasive Weed Management Plan. Plan Prepared by HES. May 2016.

HES. 2016j. Light Management Plan. Plan prepared by HES. May 2016.

HES. 2016k. Communication tower design information. Provided to ICF via email from Klete Fallowfield. July 21, 2016.

HES. 2017a. Design information regarding authorized WRDF elevations. Provided to ICF via email from Klete Fallowfield. January 10, 2017.

Hobbs, N.T. 1989. Linking energy balance to survival in mule deer: development and test of a simulation model. Wildlife Monographs 101.

Holeman, J.H. 1852. Letter to the Commissioner. In: *Annual Report of the Commissioner of Indian Affairs,* Pp. 149-155. Government Printing Office, Washington, DC.

Holloran, M.J. 2005. Greater Sage-grouse (*Centrocercus urophasianus*) Population Response to Natural Gas Field Development in Western Wyoming. PhD Dissertation. University of Wyoming. Laramie, Wyoming. 211 pp.

Hoover and Keith. 2000. Noise Control for Buildings and Manufacturing Plants.

Houghton, J.T., L.G.M. Filho, B.A. Callander, N. Harris, A. Kattenberg, and K. Maskell. 1996. Climate Change 1995: The Science of Climate Change, Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, GB, 1996. pp. 572.

HUD (Department of Housing and Urban Development). 2009. The Noise Guidebook. U.S. Department of Housing and Urban Development, Office of Community Planning and Development.

Hultkrantz. 1986. Mythology and Religious Concepts. In Warren d' Azevedo, ed., Handbook of North American Indians 11: Great Basin. P. 630-640. Washington D.C.: Smithsonian Institution.

Hurt, G. 1856. Letter to the Commissioner. In Annual Report of the Commissioner of Indian Affairs. Pp. 227-232. Government Printing Office, Washington, DC.

Hydrologic Consultants. 1999. Numerical Ground Water Flow Modeling, South Operations Area Project Amendment, Eureka County, Nevada, Prepared for Newmont Gold Company.

ICF. 2016. Air Quality Impact Assessment Technical Support Document.

Inter-Tribal Council of Nevada (ITCN). 1976. *Newe: A Western Shoshone History*. Inter-Tribal Council of Nevada. Reno.

IPCC (Intergovernmental Panel on Climate Change). 2007a. Summary for Policymakers. In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor, and H.L. Miller, Editors. Cambridge University Press, Cambridge, United Kingdom and New York, New York, USA. Available online: http://www.ipcc.ch/pdf/assessment- report/ar4/syr/ ar4_syr_spm.pdf. Accessed December 1, 2009.

IPCC. 2007b. Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (Eds.). Cambridge University Press: Cambridge, United Kingdom and New York, NY, USA. Available online: http://ipcc.ch/publications_and_data/ar4/wg1/en/contents.html. Accessed September 14, 2015.

IPCC. 2013. Summary for Policymakers. In: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.). Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. Available online: http://www.ipcc.ch/pdf/assessment-report/ar5/wg1/WG1AR5_SPM_FINAL.pdf. Accessed September 14, 2015.

Johnson, D.H., M.J. Holloran, J.W. Connelly, S.E. Hanser, C.L. Amundson, and S.T. Knick. 2011. Influences of Environmental and Anthropogenic Features on Greater Sage-Grouse Populations, 1997-2007, Chapter 17 In S.T. Knick and J.W. Connelly, eds., Greater Sage-Grouse: Ecology of a Landscape Species and Its Habitats, Studies in Avian Biology No. 38: University of California Press: Berkeley, CA, p. 407–450.

Johnson, R.E., and K.M. Cassidy. 1997. Terrestrial mammals of Washington State: Location data and predicted distributions. Volume 3 in Washington State Gap Analysis- Final Report (K.M. Cassidy, C.E. Grue, M.R. Smith, and K.M. Dvornich, eds.). Washington Cooperative Fish and Wildlife Research Unit, University of Washington, Seattle, 304 pp.

Jorgensen, J.G. 1986. Ghost Dance, Bear Dance, and Sun Dance. In, *Great Basin,* ed. By W. d'Azevedo pp. 660-672. Handbook of North American Indians, Vol. II, W.C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

Jory, J. 2002. Stratigraphy and Host Rock Controls of Gold Deposits of the Northern Carlin Trend in Bureau of Mines and Geology Bulletin 111 – Gold Deposits of the Carlin Trend.

Knick, S.T., S.E. Hanser, and K.L. Preston. 2013. Modeling ecological minimum requirements for distribution of greater sage-grouse leks: implications for population connectivity across their western range, USA. Ecology and Evolution 3(6):1539-1551.

Knight, R.L., and J.Y. Kawashima. 1993. Responses of Raven and Red-Tailed Hawk Populations to Linear Rights-of-Way. Journal of Wildlife Management 57: 266-271.

Knowles, N., M.D. Dettinger, and D.R. Cayan. 2006. Trends in Snowfall versus Rainfall in the Western United States. Journal of Climate 19(18):4545-4559.

Lakes Environmental. 2015. WRPLOT View™ from Lakes Environmental. Available online: http://www.weblakes.com/products/wrplot/index.html. Accessed December 2015.

LeBeau, C.W. 2012. Evaluation of Greater Sage-Grouse Reproductive Habitat and Response to Wind Energy Development in South-Central, Wyoming. Department of Ecosystem Science and Management, University of Wyoming, Laramie. August 2012.Leonard, Z. 1959. Narrative of the Adventures of Zenas Leonard, a Native of Clearfield County, Pa., etc., edited by John C. Ewers under the title Adventures of Zenas Leonard, Fur Trader. Norman: University of Oklahoma Press, 1959.

Linzey, A.V., and NatureServe. 2008. Tamias umbrinus. The IUCN Red List of Threatened Species 2008: Available online: http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T42585A10714881.en.

Lyon, A.G., and S.H. Anderson. 2003. Potential Gas Development Impacts on Sage-grouse Nest Initiation and Movement. Wildlife Society Bulletin 31(2):486-491.

Mahlman, J.D. 1997. Uncertainties in Projections of Human-Caused Climate Warming. Science 278(5342):1416- 1417.

Manier et al. 2014. Conservation Buffer Distance Estimates for Greater Sage-Grouse—A Review Open File-Report 2014-1239.

Maurer, D.K., R.W. Plume, J.M. Thomas, and A.K. Johnson. 1996. Water Resources and Effects of Changes in Ground-Water Use along the Carlin Trend, North-Central Nevada. U.S. Geological Survey Water-Resources Investigation Report 96-4134. Carson City, Nevada.

Maurer, E.P. 2007. Uncertainty in Hydrologic Impacts of Climate Change in the Sierra Nevada, California, under Two Emissions Scenarios. Climatic Change 82:309-325.

McBride, T., and S. Tiley. 2016. Ethnographic Report for the Proposed Rossi Mine Expansion, Elko County, Nevada. Confidential Final Report, March 2016. Report submitted to Elko District Bureau of Land Management, Elko, Nevada by Terri McBride (Community Pasts) and Shelly Tiley, PhD (Tiley Research).

MDWGC. 2012. Area 6 Mule Deer Working Group Coalition. Area 6 Mule Deer Working Group Habitat Management Practices. January 19, 2012. 63 pp.

Miller, D.E., and D.H. Miller. 1971. *Introduction and notes to Peter Skene Ogden's Snake Country Journals, 1827-1828 and 1828-1829*. Hudson's Bay Record Society, London.

Miller, J. 1983. Basin Religion and Theology: A Comparative Study of Power (Puha). *Journal of California and Great Basin Anthropology* 5 (1 and 2):66-86.

Miller, N.L., K.E., Bashford, and E. Strem. 2003. Potential Impacts of Climate Change on California Hydrology. Journal of the American Water Resources Association 39(4):771-784.

MMA (McDonald Morrissey Associates. Inc.). 1996a. Goldstrike Hydrologic Model, Barrick Goldstrike Mines, Inc., Elko and Eureka Counties, Nevada. Reston, Virginia.

MMA. 1996b. Conceptual Groundwater Flow System, Barrick Goldstrike Mines, Inc., Elko and Eureka Counties, Nevada. Reston, Virginia.

MMA. 1998. Regional Hydrologic Model, Barrick Goldstrike Mines Inc. Elko and Eureka Counties, Nevada. Reston, Virginia.

Moore, S. 2002. Geology of the Northern Carlin Trend in T. Thompson, R.J. Roberts, L. Teal, and R.O. Meeuwig, Editors. Gold Deposits of the Carlin Trend. Nevada Bureau of Mines and Geology Bulletin 111.

Murphy, R.F., and Y. Murphy. 1986. Northern Shoshone and Bannock. in *Great Basin,* Warren d'Azevedo, ed., Handbook of the North American Indians 11: pp. 284-307. Smithsonian Institution, Washington, DC.

NatureServe. 2015. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available online: http://explorer.natureserve.org.

NCEDC (Northern California Earthquake Data Center). 2016. Northern California Earthquake Data Center. UC Berkeley Seismological Laboratory. Dataset. doi:10.7932/NCEDC. Available online: http://www.ncedc.org/anss/catalog-search.html. January 29, 2016.

NDEP (Nevada Division of Environmental Protection). 2008a. Nevada Contractors Field Guide for Construction Site Best Management Practices. June. Nevada Division of Environmental Protection. Available online: https://ndep.nv.gov/bwqp/file/bmp_081808.pdf.

NDEP. 2008b. Barrick Goldstrike Mines, Inc. Class I (Title V) Air Quality Operating Permit – Minor Revision. Air Case 08AP0248. May 2008.

NDEP. 2012. Nevada Statewide Greenhouse Gas Emissions Inventory and Projections, 1990-2030. Available online: http://ndep.nv.gov/baqp/datamgt/docs/GHG%20Report%202012.pdf. Accessed December 1, 2015.

NDEP. 2015a. Nevada Guidelines for Successful Revegetation for the Nevada Division of Environmental Protection, The Bureau of Land Management, and the United States Forest Service. May. Available online: https://ndep.nv.gov/bmrr/reveg.pdf.

NDEP. 2015b. Letter from Rob Kuczynski, NDEP to Klete Fallowfield, Haliburton Energy Services Regarding: Approval of the Proposed Scope-of-Work and Implementation Schedule for Evaluating Groundwater Monitoring Wells MW-2 and MW-3 Integrity and the Subsequent Repair, Rehabilitation, and/or Replacement. February 11, 2015.

NDEP. 2015c. Email correspondence from Rob Kuczynski, NDEP to Klete Fallowfield, Haliburton Energy Services Regarding: Approval of replacement monitoring well depths. February 13, 2015.

NDEP. 2015d. Nevada Modified Sobek Procedure, 2015 update. Available online: https://ndep.nv.gov/uploads/documents/Nevada_Modified_Sobek_Procedure_-_2015.pdf.

NDEP. 2016a. Fact Sheet for Halliburton Energy Services, Inc. Rossi Barite Mine Permit Number 2015112, New Permit 2016, Fact Sheet Revision 01. Prepared by Rob Kuczynski, P.E.

NDEP. 2016b. NDEP Bureau of Mining and Regulation and Reclamation, Closure Branch web site. http://ndep.nv.gov/bmrr/clshome.html. Accessed on March 2, 2016.

NDEP. 2016c. Water Pollution Control Permit NEV2015112, Halliburton Energy Services, Inc. Rossi Barite Mine. February 19, 2016.

NDEP. 2017. Letter correspondence from Danilo Dragoni, PhD, Bureau Chief – Air Quality Planning, Nevada Division of Environmental Protection to Tom Coulter, Air Quality Modeling Specialist, Bureau of Land Management dated April 17, 2017.

NDOW. 2012b. Wildlife Action Plan. Available online: http://www.ndow.org/Nevada_Wildlife/Conservation/Nevada_Wildlife_Action_Plan/.

NDOW. 2014. Big game seasonal range shapefile data. Nevada Division of Wildlife.

NDOW. 2015a. Birds of Northeastern Nevada. Checklist available online: http://www.ndow.org/uploadedFiles/ndoworg/Content/public_documents/Wildlife_Education/nenvbird.pdf.

NDOW. 2015b. 2015-2014 Big Game Status Book. Available online: http://www.ndow.org/uploadedFiles/ndoworg/Content/Public_Meetings/Commission/2015%20Big%20Game%20Status%20Book.pdf.

NDOW. 2016a. Personal communication between Andrew Newman (ICF) and Lindsey Lesmeister (NDOW) via email dated January 25, 2016.

NDOW. 2016b. GIS shapefiles for the proposed greater-sage grouse off-site mitigation parcel. Provided to ICF via email on October 18, 2016.

NDOW. 2016c. GIS shapefiles for greater-sage grouse seasonal habitat within the Rossi Mine project area. Provided to ICF via email on March 1, 2016.

NDOW. 2017a. Comments provided on the Rossi Mine Preliminary Draft Environmental Impact Statement. Submitted to the BLM on June 23, 2017.

NDOW. 2017b. GIS shapefiles for the proposed mule deer off-site mitigation parcel. Provided to ICF via email on October 5, 2017.

NDOW. 2017c. 2016-17 Big Game Status Book. Available online: http://www.ndow.org/uploadedFiles/ndoworg/Content/Wildlife_Education/Publications/2017%20Big%20Game%20Status%20Book.pdf.

NDWR (Nevada Department of Water Resources). 2015. Designated Groundwater Basins of Nevada (1:750,000 scale map of April 2015) and pertinent county hydrographic basin listings. Nevada Department of Conservation and Natural Resources, Office of the State Engineer, Division of Water Resources. Carson City, Nevada. Available online: http://water.nv.gov/mapping/maps/designated_basinmap.pdf. Accessed December, 2015.

NDWR. 2016. Water Rights Database. Available online: http://water.nv.gov/data/hydrographic/. Accessed March 4, 2016.

Neel, L.A. 1999. Nevada Partners in Flight Bird Conservation Plan. Available online: http://www.blm.gov/wildlife/plan/pl-nv-10.pdf.

Nevada Department of Agriculture. 2012. Nevada Department of Agriculture Plant Industry Division. Noxious Weed List. Copyright 2012 Department of Agriculture. Available online: http://agri.nv.gov/Plant/Noxious_Weeds/Noxious_Weed_List/. Accessed December 2015.

Nevada Department of Taxation. 2015. Local Government Finance, Property Tax Rates for Nevada Local Governments, Fiscal Year 2015-2016.

Nevada Department of Taxation 2014. Local Government Finance, Property Tax Rates for Nevada Local Governments, Fiscal Year 2014-2015.

Nevada Department of Taxation. 2013. Annual Report, Fiscal Year 2012-2013. Available online: http://tax.nv.gov/uploadedFiles/taxnvgov/Content/TaxLibrary/AnnualReport_FY13_final.pdf. Accessed January 7, 2016.

Nevada Department of Transportation (NDOT) (Department of Transportation). 2015. 2014 Annual Traffic Report. Available online: https://www.nevadadot.com/reports_pubs/traffic_report/. Accessed December 15-16, 2015.

Nevada Department of Wildlife (NDOW). 2012a. Mule Deer Migratory Corridors; Minimum Width and Quantity – Bald Mountain Mine. August 2012.

Nevada Division of State Lands. 1986. Nevada Statewide Policy Plan for Public Lands. Available online: http://lands.nv.gov/forms/chapter1.pdf.

Nevada Governor's Sage-Grouse Conservation Team (NGSGCT). 2004. Greater Sage-grouse Conservation Plan for Nevada and Eastern California. Prepared for Nevada Governor Kenny C. Guinn by the Nevada Governor's Sage-Grouse Conservation Team. June 2004. 188 pp.

Nevada State Demographer's Office. 2014. Nevada County Population Projections 2014 to 2033. October.

Nevada State Fire Marshal. 2015. Hazardous Material Inventory Reporting and Permitting Requirements. State Fire Marshal and State Emergency Response Commission. Available online: http://fire.nv.gov/bureaus/FPL/Hazmat_Reporting_-_Chemicals/.

Nickens, P.R., S.L. Larralde, and G.C. Tucker Jr. 1981. A Survey of Vandalism to Archaeological Resources in Southwestern Colorado.

NNRDA. No Date. Northeastern Nevada Regional Railport & Industrial Park. Northeastern Nevada Regional Development Authority.

NOAA (National Oceanic and Atmospheric Administration). 2015a. National Centers for Environmental Information. Meteorological data from the NOAA. Available online: https://www.ncdc.noaa.gov/data-access. Accessed December 2015.

NOAA. 2015b. Earth System Research Laboratory. Trends in Atmospheric Carbon Dioxide. National Oceanic and Atmospheric Administration. Available online: http://www.esrl.noaa.gov/gmd/ccgg/trends/. Accessed August 10, 2015.

Norby, J.W. 2002. Geology of the Maggie Creek District Carlin Trend, Eureka County, Nevada. In: T.B. Thompson, R.J. Roberts, L. Teal, and R.O. Meeuwig, Editors. Gold Deposits of the Carlin Trend. Nevada Bureau of Mines and Geology Bulletin 111.

NPS (National Park Service). 2015. Critical Loads for Resource Protection. National Park Service. Available online: http://www.nature.nps.gov/air/studies/criticalLoads/index.cfm. Accessed December 2015.

NRCS (National Resource Conservation Service). 1968. Soil Survey of Tuscarora Mountain Area, Nevada. Parts of Elko, Eureka, and Lander Counties.

NRCS. 1986. Soil Survey of Northwest Elko County Area, Nevada. Parts of Elko and Eureka Counties. Available online: http://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/nevada/NV763/0/NorthwestElko.pdf. Accessed December 22, 2015.

NRCS. 2006. Land Resource Regions and Major Land Resource Areas of the United States, the Caribbean, and the Pacific Basin. United States Department of Agriculture Handbook 296. Available online: http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_050898.pdf. Accessed December 23, 2015.

NRCS. 2015a. Gridded Soil Survey Geographic (gSSURGO) Database for Nevada, United States. Available online: http://datagateway.nrcs.usda.gov/. 20141024.

NRCS. 2015b. The Plants Database, National Plant Data Center, Baton Rouge, Louisiana. Available online: http://plants.usda.gov. Accessed December 2015.

NRCS. 2015c. Web Soil Survey Map Unit Descriptions for Nevada, Parts of Elko County (Ninemile-Alyan Association-Tuscarora Mountains Area, Chen-Pie Creek-Alyan Association-Tuscarora Mountains area; Slaven-Ramires Association-Tuscarora Mountains area. Available online: http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx. Accessed December 2015.

Ogden, P.S. 1971. *Peter Skene Ogden's Snake Country Journals. 1817-28 and 1828-29.* Hudson's Bay Record Society, London.

Palmer, R.L. 2017. Letter from Nevada SHPO to BLM Providing Concurrence on the BLM's Final Determination of Effects for the Rossi Mine Expansion EIS.

Papke, K.G., 1984. Barite in Nevada, Nevada Bureau of Mines and Geology Bulletin 98.

Parker, K.L., C.T. Robbins, and T.A. Hanley. 1984. Energy expenditures for locomotion by mule deer and elk. Journal of Wildlife Management 48:474–488.

Pellant, M. 2007. Environmental Threats to the Great Basin. Statement of M. Pellant, Great Basin Restoration Initiative Coordinator. Bureau of Land Management U.S. Department of the Interior before the senate subcommittee on public lands and forests regarding the Great Basin Restoration Initiative. Available online: http://www.nps.gov/pore/learn/nature/upload/ climatechange_resources_congressionaltestimony_pellant_070426.pdf. Accessed February 9, 2016.

Pellant, M., P. Shaver, D.A. Pyke, and J.E. Herrick. 2005. Interpreting indicators of rangeland health, version 4. Technical Reference 1734-6. U.S. Department of the Interior, Bureau of Land Management, National Science and Technology Center, Denver, CO. BLM/WO/ST-00/001+1734/REV05. 122pp.

Peterson, M.A. 2017. BLM letter to Nevada SHPO Providing the Final Determination of Effects for the Rossi Mine Expansion EIS and Requesting Review and Concurrence.

Plume, R. 1995. Water Resources and Potential Effects of Ground-Water Development in Maggie, Marys, and Susie Creek Basins, Elko and Eureka Counties, Nevada. U.S. Geological Survey Water-Resources Investigations Report 94-4222. Prepared in cooperation with the Nevada Division of Water Resources. U.S. Geological Survey, Carson City, Nevada.

Powell, J.W., and G.W. Ingalls. Report on the Conditions of the Western Shoshones of Nevada. In: *Annual Report of the Commissioner of Indian Affairs* for 1874, pp.4J-46. Government Printing Office, Washington. DC.

Price, S., and T. Harris. 2007. An Analysis of the Economic Impacts of the Hard Rock Mining Sector on the Elko Micropolitan Statistical Area. University Center for Economic Development, University of Nevada, Reno.

PRISM (PRISM Climate Group). 2016. Average annual precipitation for specific locations 800 meter gridded data resolution, 30-year period (1981-2010). Oregon State University. Available online: http://www.prism.oregonstate.edu/explorer/. Accessed March 5, 2016.

Prudic, D.E., J.R. Harrill, and T.J. Burbey. 1995. Conceptual Evaluation of Regional Ground-water Flow in the Carbonate-Rock Province of the Great Basin, Nevada, Utah, and Adjacent States. U.S. Geological Survey Professional Paper 1409-D. U.S. Government Printing Office, Washington, D.C.

Rivera, S., N.E. West, A.J. Hernandez, and R.D. Ramsey. 2011. Predicting the impact of climate change on cheat grass (*Bromus tectorum*) invisibility for northern Utah: A GIS and remote sensing approach. Natural Resources and Environmental Issues 17(13).

Rost, G.R., and J.A. Bailey. 1979. Distribution of Mule Deer and Elk in Relation to Roads. Journal of Wildlife Management 43(3):634-641.

Rusco, M.K. 1976. Progress Report on Tosawihi Opalite (Battle Mountain -Chert) Quarry Project. Paper presented at the 15th Great Basin Anthropological Conference, Las Vegas.

Rusco, M.K. 1978. Fur Trappers in Snake Country: An ethnohistorical approach to recent environmental change. In *Holocene environmental change in the Great Basin.* Edited by Robert Elston, pp 152-173. Nevada Archaeological Research Pater 8. University of Nevada, Reno.

Rusco, M.K. 1993. Appendix A: Background Study for BLM Consultation with Native Americans on the Proposed Mining Development in the Mule Canyon Project Are, Shoshone Rage within the Traditional Territory of the Tosawihi people, Western Shoshone Nation. In Cultural Resources Background Study Report for the Mule Canyon Project, Lander County, Nevada, Archaeological Research Services, Virginia City, Nevada.

Rusco, M.K., and S. Raven. 1992. Background Study for Consultation with Native Americans on Proposed Mining Development within the Traditional Tosawihi ('White Knife') Quarry North or Battle Mountain, Nevada, in the Traditional Land of the Tosawihi People, Western Shoshone Nation. Archaeological Research Services, Inc. Virginia City, Nevada.

Sacrison Engineering. 2015. Pit Slope Stability Analysis for the Rossi Mine Expansion. Prepared by Sacrison Engineering. Elko, Nevada. March 2015.

Sawyer, H., and M. Brittell. 2014. Mule deer migration and the Bald Mountain Mine – a summary of baseline data. Prepared for the Nevada Department of Wildlife. Prepared by Western EcoSystems Technology, Inc. May 13, 2014.

Sawyer, H., F. Lindzey, and D. McWhirter. 2005. Mule Deer and Pronghorn Migration in Western Wyoming. Wildlife Society Bulletin 33(4): 1266-1273.

Sawyer, H., M.J. Kauffman, R.M. Nielson, and J.S. Horne. 2009. Identifying and prioritizing ungulate migration routes for landscape-level conservation. Ecological Applications, 19(8) pp. 2016-2025.

Sawyer, H.F., and M.J. Kauffman. 2011. Stopover Ecology of Migratory Ungulates. Journal of Animal Ecology. (80) 1078-1087.

Schafer Limited LLC. 2012. Dee Arturo Pit Lake Water Quality Prediction. Submitted to Barrick Exploration and Goldcorp Inc. Revised January 2012.

Schroedl, A. 2015. Testing and Data Recovery Excavations in the Rossi Mine Area, North-Central Nevada. P-III Associates, Inc., Salt Lake City, Utah. DOI Bureau of Land Management, Elko District, Elko, Nevada. Report No. BLM1-2956(P). Report is on file at the Elko District BLM.

Seager, R., Ting, M., Held, I, and Y. Kushnir. 2007. Model Projections of an Imminent Transition to a More Arid Climate in Southwestern North America. Science 316:1181-1184. Availalble online: www.sciencemag.org. July 25, 2016.

Service, E. 1962. *Primitive Social Organization: An Evolutionary Perspective.* Random House. New York.

Setlock. 2016. Personal communication between Dan Nally (ICF) and Mike Setlock (BLM) regarding wilderness characteristics inventories and recreational uses in the Rossi Mine Project vicinity.

SETT (Sagebrush Ecosystem Technical Team). 2014. 2014 Nevada Greater Sage-Grouse Conservation Plan. Sagebrush Ecosystem Program, State of Nevada. October 1, 2014.

SETT. 2017. Conservation Credit System Users Guide. Version 1.3. May 2017. Available online: https://www.enviroaccounting.com/NVCreditSystem/ProgramDocument/Index.

Shevenell, L., Conners, K.A., Henry, C.D., 1999. Controls on Pit Lake Water Quality at Sixteen Open-pit Mines in Nevada. Applied Geochemistry 14 (1999) 669-687. Elsevier Science Ltd.

Simpson, J.H. 1876. *Report of Explorations Across the Great Basin of the Territory of Utah for a Direct-Wagon Route from Camp Floyd to Genoa. In Carson Valley. In 1859.* U.S. Army, Engineer Dept., Washington, DC.

Smith, J.F., and K.B. Ketner. 1975. Stratigraphy of Paleozoic Rocks in the Carlin-Pinon Range Area, Nevada. Geological Survey Professional Paper 867-A. United States Government Printing Office, Washington D.C.

Smith, S.D., T.E. Huxman, S.F. Zitzer, T.N. Charlet, D.C. Housman, J.S. Coleman, L.K. Fenstermaker, J.R. Seemann, and R.S. Nowak. 2000. Elevated CO2 increased productivity and invasive species success in an arid ecosystem. Nature Vol 408 pgs. 79-82.

Spangler, J.D., S. Arnold, and J. Boomgarden. 2006. Chasing Ghosts, An Analysis of Vandalism and Site Degradation in Range Creek Canyon, Utah. Colorado Plateau Archaeological Alliance. Ogden, Utah.

SRK (SRK Consulting Inc.). 2009. Rossi Reclamation Bond, Response to Comments from the Bureau of Land Management to the 3-year Plan of Operations and Reclamation Bond Update. May 28, 2009.

SRK Consulting (U.S.), Inc., 2014b. Rossi Mine Expansion – Geology and Mineral Resources Baseline Report. August 2014.

SRK. 2013a. Geochemical Characterization Report for the Rossi Mine. Prepared for Halliburton Energy Services Inc. Battle Mountain, NV. Prepared by SRK Consulting (U.S). Elko, NV.

SRK. 2013b. Rossi Mine Expansion Project Soils, Vegetation, and Wildlife Baseline Report. Report prepared for Halliburton Energy Services. Elko, Nevada.

SRK. 2013c. Rossi Mine Expansion, Water Feature Survey – 2012 Annual Report. August 2013.

SRK. 2014a. Rossi Mine Expansion, Plan of Operations (NVN-070547) and Reclamation Permit Application (No. 0257). Prepared for Halliburton Energy Services Inc. Battle Mountain, NV. Prepared by SRK Consulting (U.S). Elko, NV.

SRK. 2014c. Letter Report – Rossi Stormwater Management – Stormwater Control Design Report. June 11, 2014.

SRK. 2014d. Rossi Mine Expansion, Surface Water Survey – 2013 Annual Report. May 2014.

SRK. 2014e. Geochemical Characterization Report for the Rossi Mine. August 2014.

SRK. 2014f. Rossi Mine 2014 Golden Eagle, Raptor, and Greater Sage-grouse Report. Report prepared for Halliburton Energy Services, Inc. July 2014.

SRK. 2014g. Rossi Mine Expansion Land Use Baseline Study. August. Prepared for Halliburton Energy Services, Inc.

SRK. 2015a. Rossi Mine Expansion Project 2014 Annual Meteorological Report. Prepared for Haliburton Energy Services, Inc. Prepared by SRK Consulting, Elko, Nevada.

SRK. 2015c. Traffic Count Survey. Available online: www.159100350_Traffic_Count_Survey_20150615_HRG_Compiled Data.pdf. Accessed May 14, 2016.

Stankowich, T. 2008. Ungulate flight responses to human disturbance: A review and meta-analysis. *Biological Conservation* 141: 2159-2173.

Stantec. 2014. Bird and Bat Conservation Strategy Rossi Mine, Elko County, Nevada. Prepared by Stantec, Reno, NV. August 20, 2014.

Stantec. 2015. 2015 Golden Eagle Nest Surveys, Greater Sage-Grouse Lek Monitoring, and Ambient Noise Monitoring. Rossi Mine, Elko County, Nevada. Prepared for Halliburton Energy Services, Inc. August 13, 2015.

Steenhof, K., M.N. Kochert, and J.A. Roppe. 1993. Nesting by Raptors and Common Ravens on Electrical Transmission Line Towers. Journal of Wildlife Management 57: 271-281.

Stevenson, A., and C.A. Lindberg (Eds.). 2010. New Oxford American Dictionary. 3rd Edition. Oxford University Press.

Steward, J.H. 1938. Basin-Plateau Aboriginal Socio-Political Groups. Bulletin Number 120. Bureau of American Ethnology. Washington: Government Printing Office.

Steward, J.H. 1939. Some Observations on Shoshonean Distribution American Anthropologist 441: 261-265.

Steward, J.H. 1940. Native Cultures of the Intermontane (Great Basin) Area. Pp. 445-502 In Essays in Historical Anthropology of North America. Published in Honor of John R. Swanton. Smithsonian Miscellaneous Collections 100. Washington D.C.: Smithsonian Institution.

Steward, J.H. 1941. Culture Element Distributions XII: Nevada Shoshone. University of California Anthropological Records 4(2): 209-360.

Stewart, I.T., D.R. Cayan, and M.D. Dettinger. 2004. Changes in Snowmelt Runoff Timing in Western North America under a “Business as Usual” Climate Change Scenario. Climatic Change 62:217–232.

Stewart, J.H. 1980. Geology of Nevada, A Discussion to Accompany the Geologic Map of Nevada. Nevada Bureau of Mines and Geology Special Publication 4, 136 pp.

Stewart, J.H. and J.E. Carlson. 1976 Geologic Map of North Central Nevada. Scale 1:250,000. Nevada Bureau of Mines Map 50. January 1, 1976.

Stewart, J.H., and E.H. McKee. 1977. Geology and Mineral Deposits of Lander County, Nevada, Part 1, Geology. Nevada Bureau of Mines and Geology Bulletin 88, 106 pp. Mackay School of Mines, University of Nevada, Reno.

Stewart, O.C. 1942. *Culture Element Distributions. XVIII. Ute-Southern Paiute*, by Omer C. Stewart. University of California Press.

Stewart, O.C. 2002. *Forgotten Fires*. Edited and with introductions by Henry T. Lewis and M. Kat Anderson. University of Oklahoma Press, Norman.

Teal, L, and M. Jackson 2002. Geologic Overview of the Carlin Trend Gold Deposits. In: Thompson, T.B., L. Teal, and R.O. Meeuweg, (eds), 2002, Gold Deposits of the Carlin Trend. Nevada Bureau of Mines and Geology Bulletin No. 111. Available online: https://explorationinsights.com/MediaLib/Downloads/Home/Geologic_Overview_of_Carlin_Deposits_2002.pdf.

Theodore, T.G., B.C. Moring, T. Chadwick, P.J. Dobac, J.K. Cluer, and R.J. Fleck. 2006. Geology of the Santa Renia Fields Quadrangle, Elko and Eureka Counties, Nevada. Nevada Bureau of Mines and Geology Map 155.

Thomas, D.H., L.S. Pendleton, and S.C. Cappannri. 1986. Western Shoshone. In *Great Basin,* edited by Warren L. d' Azevedo, pp. 161-183. Handbook of North American Indians, Vol. II, W.C. Sturtevant, general editor. Smithsonian Institution, Washington, D.C.

Tiley, S. 2010. Consultation with the Western Shoshone Regarding the Tosawihi Quarries Traditional Cultural Property. BLM, Elko District.

Tiley, S. 2012. *Ethnographic Study for the North Elko Pipeline Project.* Prepared by Zeier and Associates for the Bureau of Land Management, Elko, Nevada.

Tingley, J.V. 1998. Mining Districts of Nevada. Nevada Bureau of Mines and Geology. Report 47. Second Edition. Mackay School of Mines, University of Nevada, Reno. 329pp.

Tull., J.D. 2015. Acoustic Impacts and Sage-grouse: A Review of Current Science, Sound Measurement Protocols, and Management Recommendations. Habitat Division, Nevada Department of Wildlife. August 2015.

University of Montana, the Arthur Carhart National Wilderness Training Center, and the Aldo Leopold Wilderness Research Institute. 2015. Wilderness Areas by Location. Available online: http://www.wilderness.net/NWPS/stateView?state=NV. Accessed December 21, 2015.

USACE (U.S. Army Corps of Engineers). 2008. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0). ERDC/EL TR-08-28, U.S. Army Engineer Research and Development Center, Vicksburg, Mississippi. U.S. Army Corps of Engineers.

USACE. 2015. Jurisdictional determination letter of November 12, 2015 from K.S. Hansen, Acting Chief, Nevada-Utah Regulatory Division, U.S. Army Engineer District, Sacramento, California, to K. Fallowfield, Halliburton Energy Services.

USCB (U.S. Census Bureau). 1990. 1990 Census of Population and Housing, Public Law 94-171 Data (Official) Age by Race and Hispanic Origin. U.S. Census Bureau.

USCB. 2000. Profile of General Demographic Characteristics: 2000. Census 2000 Summary File. U.S. Census Bureau.

USCB. 2010. Geography-Spring Creek CDP, Nevada: Profile of General Population and Housing Characteristics: 2010. 2010 Census Summary File 1. U.S. Census Bureau.

USCB. 2013. 2013 Business County Patterns, Lander County, Nevada. U.S. Census Bureau.

USCB. 2014a. American Community Survey 5-year Estimates, 2010-2014. Demographic and Housing Estimates. DP04: Selected Housing and V25004: Vacancy Status.

USCB. 2014b. American Community Survey 5-year estimates, 2010-2014. Race and Ethnicity. U.S. Census Bureau. Available online: http://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml. Accessed December 18, 2015.

USCB. 2014c. American Community Survey 5-year estimates, 2010-2014. U.S. Census Bureau. Selected Economic Characteristics. Available online: http://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml. Accessed December 18, 2015.

USCB. 2014d. TIGER/Line Shapefiles and geospatial data. Available online: https://www.census.gov/geo/maps-data/data/tiger.html.

USEPA (U.S. Environmental Protection Agency). 1974. Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety. Prepared by the EPA Office of Noise Abatement and Control.

USEPA. 1994. Technical Document: Acid Mine Drainage Prediction. EPA530-R-94-036.

USEPA. 2003. EPA Guidance for Estimating Natural Visibility Conditions Under the Regional Haze Rule. EPA-454/B-03-005. Available online: http://www.epa.gov/ttnamti1/files/ambient/visible/natural.pdf.

USEPA. 2004a. User's Guide for the AMS/EPA Regulatory Model—AERMOD. U.S. EPA Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina (EPA-454/B-03-001).

USEPA. 2004b. User's Guide for the AERMOD Meteorological Preprocessor (AERMET). U.S. EPA Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina (EPA-454/B-03-002).

USEPA. 2004c. User's Guide for the AERMOD Terrain Preprocessor (AERMAP). U.S. EPA Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina (EPA-454/B-03-003).

USEPA. 2006a. Fifth Edition of AP 42 "Compilation of Air Pollutant Emission Factors Volume I: Stationary Point and Area Sources." Section 13.2.2, Unpaved Roads. Available online: http://www.epa.gov/ttnchie1/ap42/.

USEPA. 2006b. RCRA Orientation Manual. U.S. Environmental Protection Agency Office of Solid Waste/Communications, Information, and Resources Management Division. EPA 530-R-06-003, March 2006.

USEPA. 2010. Air Toxics Database. U.S. EPA Office of Air Quality Planning and Standards, Technology Transfer Network Air Toxics Website. Available online: http://www.epa.gov/ttn/atw/toxsource.

USEPA. 2011a. Addendum User's Guide for the AERMOD Terrain Preprocessor (AERMAP). U.S. EPA Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina.

USEPA, 2011b. Additional Clarification Regarding the Application of Appendix W Modeling Guidance for the 1-hr NO2 National Ambient Air Quality Standard. Tyler Fox Memorandum dated March 1, 2011, Research Triangle Park, North Carolina 27711. Available online: http://www.epa.gov/ttn/scram/Additional_Clarifications_AppendixW_Hourly-NO2-NAAQS_FINAL_03-01-2011.pdf.

USEPA. 2012. EPA's National Emission Inventory for 2011. (EPA 2011 NEI, Version 6). Available online: ftp://ftp.epa.gov/EmisInventory/2011v6/v1platform/. Accessed December 2015.

USEPA. 2013. "AERSURFACE User's Guide." U.S. EPA Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina (EPA-454/B-08-001).

USEPA. 2014. Motor Vehicle Emission Simulator (MOVES 2014). U.S. Environmental Protection Agency. Available online: http://www3.epa.gov/otaq/models/moves/.

USEPA. 2015a. EPA's National Ambient Air Quality Standards (NAAQS). Available online: http://www3.epa.gov/ttn/naaqs/criteria.html. Accessed December 2015.

USEPA. 2015b. EPA's Air Data. Monitor Values Report. Available online: http://www3.epa.gov/airdata/ad_rep_mon.html. Accessed December 2015.

USEPA. 2015c. Addendum User's Guide for the AMS/EPA Regulatory Model—AERMOD. U.S. EPA Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina.

USEPA. 2015d. Addendum User's Guide for the AERMOD Meteorological Preprocessor (AERMET). U.S. EPA Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina.

USEPA. 2015e. Climate Change Indicators in the United States: Atmospheric Concentrations of Greenhouse Gases. Available online: http://www.epa.gov/climatechange/pdfs/print_ghg-concentrations-2015.pdf. Accessed August 10, 2015.

USEPA. 2015f. Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2013. EPA 430-R-15-004. April. Available online: http://www.epa.gov/climatechange/Downloads/ghgemissions/US-GHG-Inventory-2015-Main-Text.pdf. Accessed December 1, 2015.

USFS (U.S. Forest Service). 2000. Screening Methodology for Calculating ANC Change to High Elevation Lakes. U.S. Forest Service. Rocky Mountain Region. December 2000. Available online: http://www.fs.fed.us/air/documents/anc_scre.pdf.

USFS. 2005. Wildland Fire in Ecosystems: Effects of Fire on Soil and Water. (General Technical Report RMRS-GTR-42. Volume 4.) Rocky Mountain Research Station. Available online: http://www.fs.fed.us/rm/pubs/rmrs_gtr042_4.pdf. Accessed: January 2016.

USFS. 2013. Memorandum of Understanding Regarding the Establishment of a Partnership for the Conservation and Protection of the Greater Sage-Grouse and Greater Sage-Grouse Habitat.

USFWS (U.S. Fish and Wildlife Service). 1994. Lahontan Cutthroat Trout (*Oncorhynchus clarki henshawi*) Recovery Plan. USFWS Region 1, Portland, Oregon 157 pp.

USFWS. 2008. Birds of Conservation Concern Plan. December. Available online: http://www.fws.gov/migratorybirds/pdf/grants/BirdsofConservationConcern2008.pdf.

USFWS. 2012. Eagle Permit Definitions. Available online: http://www.fws.gov/midwest/midwestbird/eaglepermits/definitions.html.

USFWS. 2013. Greater Sage-grouse (*Centrocercus urophasianus*) Conservation Objectives: Final Report. U.S. Fish and Wildlife Service, Denver, CO. February 2013.

USFWS. 2015. Information for Planning and Conservation. Special Status Species CESA boundary report.

USGCRP (U.S. Global Change Research Program). 2009. Global Climate Change Impacts in the United States. T.R. Karl, J.M. Melillo, and T.C. Peterson, Editors. Cambridge University Press, 2009.

USGS (U.S. Geological Survey). 2013. Landfire Existing Vegetation Type Layer. Department of Interior, Geological Survey. Available online: http://landfire.cr.usgs.gov/viewer/. Accessed September 16, 2015.

USGS (U.S. Geological Survey). 2016. Quaternary Fault and Fold Database for the United States. Available online: http://earthquake.usgs.gov/regional/qfaults. Accessed January 2016.

WAFWA (Western Association of Fish and Wildlife Agencies). 2015. Greater Sage-Grouse Population Trends: An Analysis of Lek Count Databases 1965-2015. August.

Walker, B.L., D.E. Naugle, and K.E. Doherty. 2007. Greater Sage-grouse Population Response to Energy Development and Habitat Loss. Journal of Wildlife Management 71(8):2644-2654.

Ward, A.L. 1976. Elk Behavior in Relation to Timber Harvest Operations and Traffic on the Medicine Bow Range in South-central Wyoming. In: Elk-logging-roads. Symposium Proceedings. Editor: S.R. Heib. pp. 32-43. Moscow University of Idaho.

Wasson, W. 1862. Report from the Acting Agent to the Superintendent of Indian Affairs, Carson City. In Letters Received by the Office of Indian Affairs, M-234, Roll 538, January 28, 1862. National Archives, Washington, DC. Microfilm.

Watkins, R.Z., J. Chen, J. Pickens, and K.D. Brosofske. 2003. Effects of Forest Roads on Understory Plants in a Managed Hardwood Landscape. Conservation Biology 17(2):411-419.

WBWG (Western Bat Working Group). 2016. Western Bat Working Group Species Accounts. Available online: http://wbwg.org/western-bat-species/ (12/15/2016).

Westbrooks, R. 1998. Invasive Plants, Changing the Landscape of America: Fact Book. Federal Interagency Committee for the Management of Noxious and Exotic Weeds (FICMNEW). Washington, D.C.

Western Cordillera. 2006. An Integrated Petroleum Evaluation of Northeastern Nevada. Available online: http://westerncordillera.com/evaluation_contents.htm. Site updated September 12, 2006. Accessed February 25, 2016.

Wildlife Action Plan Team. 2012. Nevada Wildlife Action Plan. Nevada Department of Wildlife, Reno. Available online: http://www.ndow.org/Nevada_Wildlife/Conservation/Nevada_Wildlife_Action_Plan/.

WRCC (Western Regional Climate Center). 2008. Local Climate Data. Summaries for the Western U.S. Winnemucca Municipal Airport 1996-2008. Available online: http://www.wrcc.dri.edu/summary/wmc.nv.html. Accessed December 2015.

WRCC. 2016. NCDC 1981-2010 Monthly Normals, Tuscorora, Nevada (26836) (1981-2010). Available online: http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?nv8346. Accessed March 7, 2016.